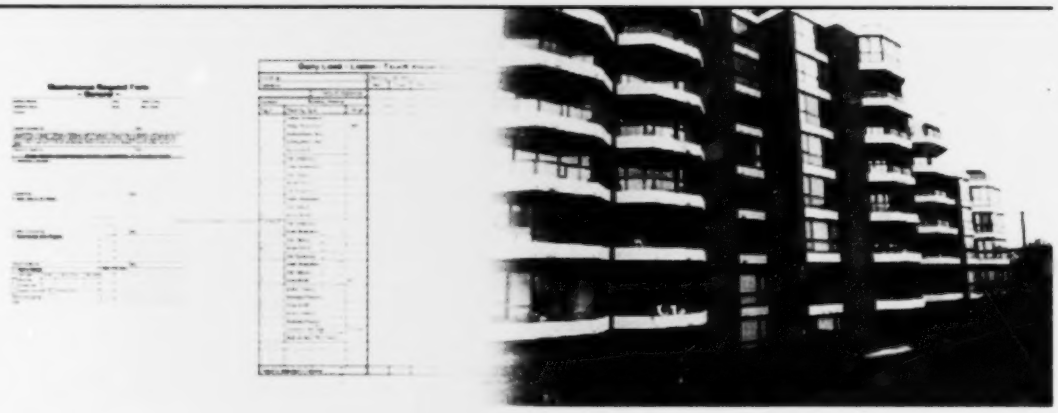
OPERATIONS MANUAL FOR MAINTENANCE AND CUSTODIAL STAFF

Multi-Unit Residential Buildings



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Operations Manual for Maintenance and Custodial Staff of Multi-Unit Residential Buildings

Canada Mortgage and Housing Corporation

July 2003

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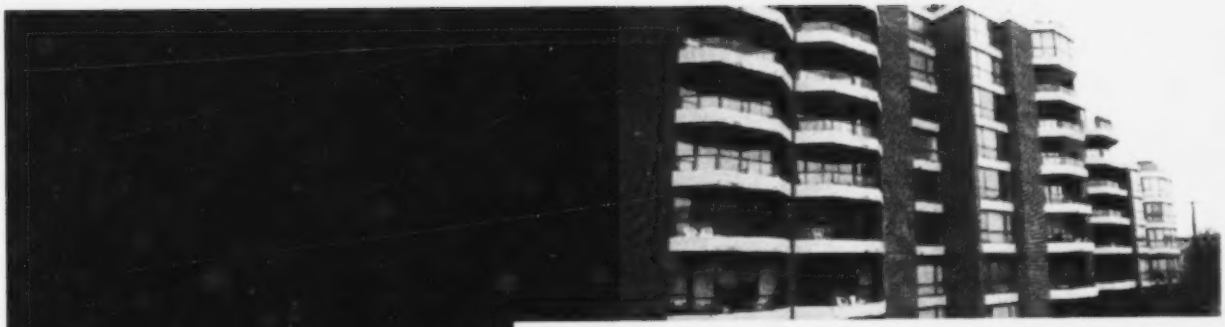


SECTION 1.0

introduction

Section 1.0 General

1.1 Introduction

Operational expenses represent up to 66 per cent of the overall annual expenses of multi-unit residential buildings. Unlike other building-related expenses, the operating budget represents an expense that the property owner, or manager, has some control over. It is estimated that in many multi-unit residential buildings, operation- and maintenance-related expenses could be reduced by up to 25 per cent by adopting more efficient and effective maintenance practices.

Canada Mortgage and Housing Corporation developed this manual as a service to property owners and managers of multi-unit residential buildings, in cooperation with the Canadian Condominium Institute, and the Association of Condominium Managers of Ontario. Its purpose is to reduce the cost of operating multi-unit residential buildings, improve the overall affordability and to sustain the stock of apartment buildings in Canada.

The information contained in this manual provides helpful direction for maintenance and custodial staff to improve the overall performance of apartment buildings in terms of durability and occupant health and safety.

By adopting the operating practices recommended by this manual, the maintenance and custodial staff of multi-unit residential buildings will ensure the buildings under their care will operate efficiently and cost effectively.

1.2 Overview

The purpose of this manual is to provide the maintenance and custodial staff of multi-unit residential buildings with the following information:

1. Guidance to perform daily, weekly, monthly and annual tasks.
2. Information to help diagnose problems within the building.
3. Guidance to perform minor repairs and preventative maintenance.
4. Guidelines indicating when outside contractors and engineers are required.
5. Dealing with tenant concerns.

The information is organized in the following sections:

1.0 General
- Information on the use of this manual
- Safety guidelines for maintenance and custodial tasks

2.0 Housekeeping
- Interior cleaning
- Interior pest control

3.0 Grounds keeping
- Exterior cleaning
- Landscaping
- Weed, pest and disease control

4.0 Building Envelope
- Structural problems (cracks, leaks, etc.)

5.0 Electrical, Lighting, Motors and Appliances
- Electrical safety
- Diagnosing distribution problems
- Diagnosing appliance problems

6.0 Fire Protection
- Routine maintenance and tests for fire protection equipment

7.0 Plumbing and Drainage
- Maintenance and repair of plumbing and drainage systems

8.0 Heating, Cooling and Other Mechanical Systems

- Maintenance of the heating, cooling and ventilation systems
- Maintenance for common items such as motors, belts, sheaves, fans, pumps, etc.
- Elevator and overhead door maintenance

9.0 Security and Communication

- Maintenance of intercom and closed circuit camera systems
- Security guidelines

1.3 Instructions for Manual Use

Each section of this manual is further divided into subsections. The subsections are organized first to describe a problem and then to provide a response. The following example illustrates the setup within the sections. It also describes how to use this manual.

1.3.1 Problem Occurence

Description: A problem arises where the building operator needs guidance. A response is required to prevent damage to the building and health risk to the occupants.

Action

1. Use the ***Table of Contents*** and decide which section is most likely to address this particular problem.

2. Read the **Description** of the problem to ensure that the two problems are similar and to obtain background information as to the possible causes.

3. If the two problems are similar, follow the **Action** or **Troubleshooting** plan. If not, recheck the ***Table of Contents***.

4. Call a specialist to fix the problem if not repaired by following the **Action** or **Troubleshooting** plan.

1.4 Workplace Safety

Safety in the workplace is of utmost importance, and should never be taken lightly. In general, workers must be properly trained to perform potentially dangerous tasks. The following safety measures should be followed at all times:

Action

1. Wear eye, head, or face protection when there is a risk of injury from equipment or from hazardous materials.

2. Keep all tools and equipment clean and in a safe operating condition. Ground all stationary electrically powered equipment, tools and devices located within reach of a person who can make contact with any grounded surface or object. Always use the appropriate tools and equipment.

3. Report all job-related injuries to the supervisor, regardless of how minor they may seem.

4. Inform employees of any potential danger. Inform tenants of potentially dangerous areas accessible to them. Any such areas should be adequately marked and cordoned off.

1.4.1 WHMIS

The ***Workplace Hazardous Materials Information Systems*** (WHMIS) is a Canada-wide system designed to provide information on hazardous materials to employers and employees. It essentially gives everyone in the workplace the ***"Right to Know."*** The three elements to the workers' ***"Right to Know"*** are:

1. Warning Labels on Containers. These labels indicate the potential dangers of a hazardous material. (See ***Figure 1.1***)

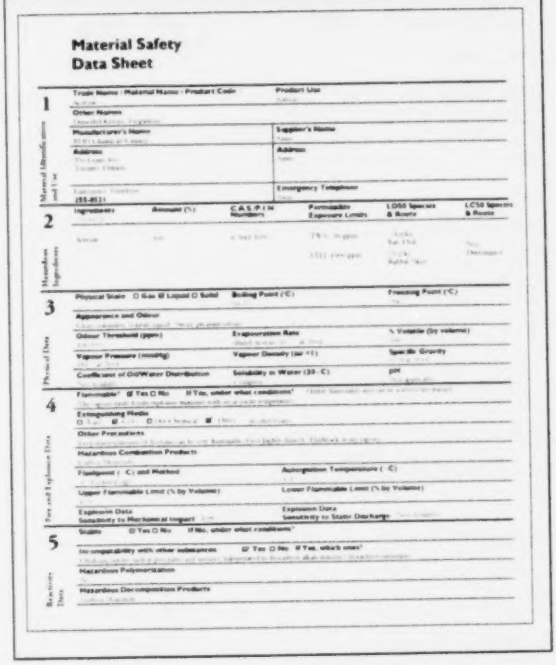
Figure 1.1 Sample Warning Label

2. Material Safety Data Sheet. These sheets provide additional information, including the contents and concentrations of hazardous materials. These sheets must be made available to the employee. (See ***Figure 1.2***)

3. Worker Training. All employees working with hazardous materials must have WHMIS training.

For further information regarding WHMIS, contact the provincial government.

Figure 1.2 - Sample Material Safety Data Sheet


Material Safety
Data Sheet

1 Material Identification and Use
2 Hazardous Ingredients
3 Physical Data
4 Fire and Explosion Data
5 Reactivity Data

1.4.2 Safety Legislation

Each province has its own legislation addressing workplace safety and workers' rights. For example, Ontario has the *Occupational Health and Safety Act* that states the duties of the employer and the rights of the employee. The act also makes legal the requirements of WHMIS.

Contact the department of labour within the provincial government for specific information on applicable legislation.

1.4.3 Lifting and Carrying

Description: Effective lifting techniques depend greatly on the skillful use of the proper muscles, and not on sheer strength alone. The experienced lifter crouches as close to the load as possible with the knees bent at about a 90-degree angle and the back as straight as possible. To lift the object, straighten the legs while swinging the back to a vertical position.

The National Safety Council suggests that men should lift no more than 34 kilograms, or half their own weight—whichever is less. Women should lift no more than 16 kilograms or one third of their own weight. Other lifting strategies are worth noting:

Action

1. Grip the object with the whole palm of the hand.
2. Lift in easy stages.
3. Keep the feet 25-30 cm apart for good balance.
4. Do not twist the body while lifting or carrying.
5. Carry the object with arms close to the sides and fully extended.
6. Lower the load by bending the legs with back and arms straight.

1.4.4 Ladder Safety

Description: Every employee should be familiar with the basic guidelines for the safe use of ladders. Ladders should only be used for the purpose for which they were designed.

Action

1. Examine ladders before each use. Ladders should be CSA approved, and should be undamaged. Ladders requiring repairs should be tagged and marked: "Dangerous—Do Not Use."
2. Use only ladders equipped with safety feet or sharp spurs. Where the ladder appears insecure or if it is longer than nine meters, tie the top of the ladder to a fixed support on the building using a strong rope or strap.
3. Set the ladder on a secure footing. Ladders should not be placed on boxes, barrels or other unstable bases.
4. Place the base of the ladder 30cm (1 foot) away from the wall for every 1.2 m (4 feet) it reaches up to obtain a safe working angle. When used to access roofs or other areas ladders should extend at least 1.0 m above the roof line.
5. Open stepladders fully before climbing. Make sure that all movable parts operate freely. Do not use the top of the ladder or the pail shelf as a step.
6. Face the ladder squarely to the surface to avoid sliding down.
7. Keep both hands free while climbing up and down the ladder and keep hands away from electrical wires or other sources of power, especially while using aluminum ladders. Small articles should be carried in pockets or on a belt. Larger articles should be lifted or lowered by a hand line.
8. When it is necessary to place a ladder over a doorway, lock or bolt the door shut.

9. Create a barricade, or position someone in the area in front of the ladder if placed in an aisle or a location where it could be struck by people or other objects.

10. Fasten a board across the top of the ladder, secured by screws, when it is to be placed against a window sash. The board should be long enough to span the opening and rest on each side of the window frame.

11. Securely tie or fasten ladders when they are used on rooftops.

12. Keep ladders clean and free from dirt or paint that may conceal defects. All surfaces of rails and rungs should be kept free of grease, oil or other materials that could create a hazardous condition.

13. For further information and legal limitations for ladder safety, contact your provincial Ministry of Labour.

1.5 Maintenance Request Form

Description: A ***Maintenance Request Form*** should be filled out and forwarded to the building manager every time there is a maintenance request from a tenant. Blank versions of these forms are located at the end of this chapter. There are three types of forms:

1. ***Maintenance Request Form - Heating.*** Use this form when there are heating complaints within the suite. Instructions on filling out this form are discussed in section ***8.0 Heating, Cooling and Other Mechanical Systems.***

2. ***Maintenance Request Form - Rainwater Infiltration.*** Use this form when there is rainwater infiltration through the building envelope. Instructions on filling out this form are discussed in section ***4.0 Building Envelope.***

3. ***Maintenance Request Form - General.*** This is a general form used for any in-suite problems other than heating complaints or rainwater infiltration. (See ***Figure 1.3***)

Figure 1.3 Maintenance Request Form – General

Maintenance Request Form
-- General --

Building Address | Floor | Home Phone
Resident's Name | Suite | Work Phone
Request
Request Received By | Date
I, the undersigned, hereby acknowledge that I requested the maintenance described below to be done in my apartment. I expect that this work will be completed as soon as possible. I authorized the management staff, or if necessary, a contractor to enter my apartment during reasonable hours in order to complete the work. Notwithstanding my absence from the apartment at the time of entry, my signature on this request form shall be my consent to enter my apartment to do the work described below. Should more than one visit be necessary to correct the problem I also give my consent.
Resident's Signature | Date
Resident: Please fill out the above information and submit to the Superintendent. Do not fill out beyond this point.
A Conditions in the Suite
Inspected By | Date
B Action Taken to Fix Problem
Problem Corrected By | Date
C Recommended Action Required
Recommended By | Date
D Property Manager | Work to be Done
Action Taken | Number | Who to Contact | Date Ordered
Work Order
Purchase Order
Resident to be invoiced ? | Insurance Claim #
Work Authorized By
Date

A. Conditions in the Suite:
To be filled out by the Superintendent during the initial suite inspection.

B. Action Taken to Fix Problem:
To be filled out by the Superintendent if the problem is easily fixed by the on-site staff.

C. Recommended Action Required:
To be filled out by the Superintendent if parts or outside service are required.

D. Property Manager:
To be filled out by the property manager to authorize any repair work.

Action

1. When a tenant complains about an in-suite maintenance problem, fill out the top section of the ***Maintenance Request Form***, and have the tenant sign and date it. Get as much information about the problem as possible. Questions such as *"When did the problem start?" "Is the problem worse at certain times of the day, or certain outdoor conditions?", "What do you think the source of the problem is?"*, etc. will help to diagnose the problem.

2. Visit the suite as soon as possible to inspect the problem. The inspection should result in one of four decisions:

   i) Fix the problem immediately.
   ii) Order the parts required to fix the problem.
   iii) Have the problem repaired by an outside service person that specializes in that particular field.
   iv) In situations where the solution to the problem is not clear, consult with the property manager or building owner to determine how to proceed.

   Write down everything noticeable about the problem in **section A** of the ***Maintenance Request form.*** If the problem cannot be easily resolved, write down a recommended course of action in **section C** of the form.

3. Have the problem fixed if it can be done on-site with available tools and inventories, and write down the action taken in **section B** of the form. If the problem is outside of the expertise of the on-site staff, have the problem looked at by an outside service person. It will cost less in the long run or may be required by Building Codes (electrical work for example).

4. Give the form to the property or maintenance manager.

1.6 Look/Listen/Touch Inspection

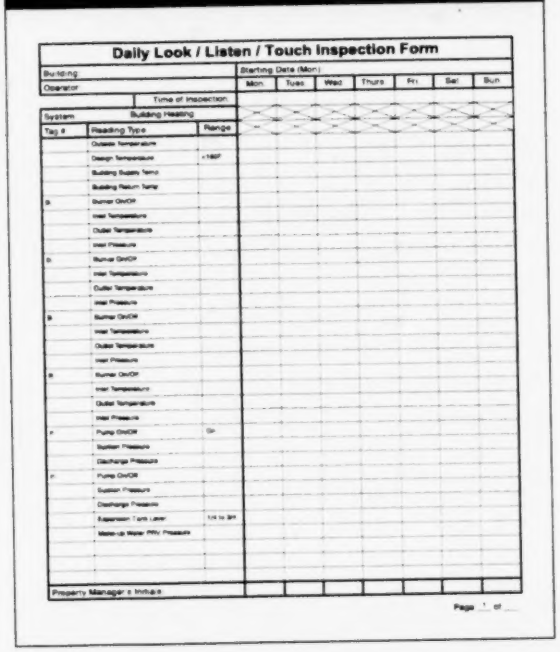
Description: The least expensive and most effective method of maintaining a building is to correct minor problems before they become major problems. All equipment in the building should be checked at least weekly, and a ***Look/Listen/Touch Inspection Form*** should be completed. A blank version of this form is available at the end of this chapter. The ***Look/Listen/Touch*** inspection is important because:

1. It ensures all equipment is operating properly and detects breakdowns.

2. It ensures that all readings from gauges, meters, thermometers, etc., for the various equipment and systems in the buildings are within their expected ranges. This allows proper operation and detection of problems.

3. It allows building operators to familiarize with the equipment, and to discover problems in the early stages while they can be easily fixed with little building disruption.

Figure 1.4 Look / Listen / Touch Inspection Form



Daily Look / Listen / Touch Inspection Form

Building
Operator
Time of Inspection
System: Building Heating
Starting Date (Mon.)
Mon. | Tues. | Wed. | Thurs. | Fri. | Sat. | Sun.
Tag # | Reading Type | Range
Outside Temperature
Design Temperature | +180F
Building Supply Temp
Building Return Temp
a
Burner On/Off
Inlet Temperature
Outlet Temperature
Inlet Pressure
b
Burner On/Off
Inlet Temperature
Outlet Temperature
Inlet Pressure
c
Burner On/Off
Inlet Temperature
Outlet Temperature
Inlet Pressure
d
Burner On/Off
Inlet Temperature
Outlet Temperature
Inlet Pressure
e
Burner On/Off
Inlet Temperature
Outlet Temperature
Inlet Pressure
f
Pump On/Off | On
Suction Pressure
Discharge Pressure
g
Pump On/Off
Suction Pressure
Discharge Pressure
Expansion Tank Level | 1/4 to 3/4
Make-up Water PRV Pressure
Property Manager's Initials
Page 1 of

System: Indicates the building system being checked
Tag #: The tag number of the equipment being checked.
Reading Type: The information being obtained from the equipment.
Range: The expected operating value or range of the reading.

Action

1. Record the readings in the day column, and note any values outside of the recommended range or that have changed significantly from reading to reading. Notify the property manager when problems with the readings are detected.

2. Observe the operation of the equipment, looking for anything out of the ordinary such as equipment vibrations, unusual noises, water leaks, overheating of equipment, frequent cycling (on-off) of equipment, etc. If fixing the problem is beyond the expertise of the on-site staff, notify the property manager.

3. When the ***Look/Listen/Touch*** form is complete, give it to the property manager.

Further Reading

The Institute of Real Estate Management, **The Resident Manager: On-Site Management Handbook for Apartments and Condominiums**, *The Institute of Real Estate Management*

Liska, Roger W., PE, and Judeth Morrison Liska, **Handbook of Building and Plant Maintenance Forms**, *Prentice-Hall Inc.*

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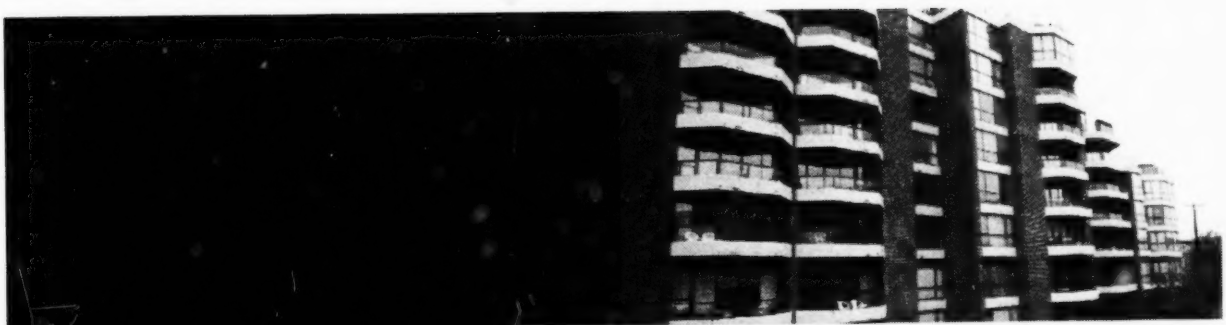
WHMIS Division Health Canada
(613) 957-2342
http://www.hc-sc.gc.ca/hecs-sesc/whmis



BLANK FORMS

Daily Look / Listen / Touch Inspection Form

Building:			Starting Date (Mon):						
Operator:			Mon.	Tues.	Wed.	Thurs.	Fri.	Sat.	Sun.
	Time of Inspection:								
System:	Building Heating								
Tag #	Reading Type	Range							
	Outside Temperature								
	Design Temperature	<180F							
	Building Supply Temp								
	Building Return Temp								
B-	Burner On/Off								
	Inlet Temperature								
	Outlet Temperature								
	Inlet Pressure								
B-	Burner On/Off								
	Inlet Temperature								
	Outlet Temperature								
	Inlet Pressure								
B-	Burner On/Off								
	Inlet Temperature								
	Outlet Temperature								
	Inlet Pressure								
B-	Burner On/Off								
	Inlet Temperature								
	Outlet Temperature								
	Inlet Pressure								
P-	Pump On/Off	On							
	Suction Pressure								
	Discharge Pressure								
P-	Pump On/Off								
	Suction Pressure								
	Discharge Pressure								
	Expansion Tank Level	1/4 to 3/4							
	Make-up Water PRV Pressure								
Property Manager's Initials:									

Page 1 of ___

Daily Look / Listen / Touch Inspection Form

Building:			Starting Date (Mon):						
Operator:			Mon.	Tues.	Wed.	Thurs.	Fri.	Sat.	Sun.
	Time of Inspection:								
System:	Misc. Heating System								
Tag #	Reading Type	Range							
B-	Burner On/Off								
	Inlet Temperature								
	Outlet Temperature								
	Inlet Pressure								
B-	Burner On/Off								
	Inlet Temperature								
	Outlet Temperature								
	Inlet Pressure								
P-	Pump On/Off	On							
	Suction Pressure								
	Discharge Pressure								
P-	Pump On/Off								
	Suction Pressure								
	Discharge Pressure								
	Primary Heating Supply Temp.								
	Primary Heating Return Temp.								
	Expansion Tank Level	1/4 to 3/4							
	Make-up Water PRV Pressure								
Property Manager's Initials:									

Page 2 of ___

Daily Look / Listen / Touch Inspection Form

Building:			Starting Date (Mon):						
Operator:			Mon.	Tues.	Wed.	Thurs.	Fri.	Sat.	Sun.
	Time of Inspection:								
System:	Domestic Hot Water								
Tag #	Reading Type	Range							
B-	Burner On/Off								
	Pump On/Off								
	Outlet Temperature								
	Outlet Pressure								
B-	Burner On/Off								
	Pump On/Off								
	Outlet Temperature								
	Outlet Pressure								
P-	Recirc. Pump On/Off	On							
	Tank Temperature								
	Tank Temperature								
	Supply Water Temperature								
System:	Corridor Supply Air								
SF-	Corridor Fan On/Off								
	Corridor Temperature								
	Burner #1 On/Off								
	Burner #2 On/Off								
P-	Glycol Pump On/Off								
	Glycol Supply Temp.								
	Expansion Tank Level	1/4 to 3/4							
Property Manager's Initials:									

Page 3 of ___

Daily Look / Listen / Touch Inspection Form

Building:			Starting Date (Mon):						
Operator:			Mon.	Tues.	Wed.	Thurs.	Fri.	Sat.	Sun.
	Time of Inspection:								
System:	Chilled Water Plant								
Tag #	Reading Type	Range							
CH-	Chiller On/Off								
	Oil Temperature Heater On/Off								
	Chilled Water Supply Temp.								
	Condenser Water Temperature								
CT-	Cooling Tower High/Low/Off								
P-	Chilled Water Pump On/Off								
P-	Condenser Water Pump On/Off								
	Room Temperature								
	Cooling Tower Water Meter Reading								
System:	Elevator Machine Room								
EL-	Elevator On/Off								
EL-	Elevator On/Off								
EL-	Elevator On/Off								
EL-	Elevator On/Off								
	Exhaust Fan On/Off								
	Room Temperature								
	Fire Hose Cabinet Pressure								
Property Manager's Initials:									

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Daily Look / Listen / Touch Inspection Form

Building:			Starting Date (Mon):						
Operator:			Mon.	Tues.	Wed.	Thurs.	Fri.	Sat.	Sun.
	Time of Inspection:								
System:	Pool Mechanical Room								
Tag #	Reading Type	Range							
P-	Pump On/Off								
MAU -	Make-Up Air Fan On/Off								
	Supply Air Temperature								
EF -	Exhaust Fan On/Off								
	Return Air Temperature								
System:	Emergency Generator								
EG -	Generator Block Heater On/Off	On							
	Room Temperature								
	Clock Reading								
System:	Utility Meters								
	Water Meter Reading								
	Main Electrical Meter Reading								
	Demand Meter - Red Needle								
	Demand Meter - Black Needle								
	Main Gas Meter Reading								
Property Manager's Initials:									

Daily Look / Listen / Touch Inspection Form

Building:			Starting Date (Mon):						
Operator:			Mon.	Tues.	Wed.	Thurs.	Fri.	Sat.	Sun.
	Time of Inspection:								
System:	Domestic Water Booster Pumps								
Tag #	Reading Type	Range							
P-	Booster Pump On/Off								
	Inlet Pressure								
	Outlet Pressure								
P-	Booster Pump On/Off								
	Inlet Pressure								
	Outlet Pressure								
System:	Fire Safety Systems								
P -	Main Fire Pump On/Off/Auto	Auto							
	Inlet Pressure								
	Outlet Pressure								
P -	Fire Jockey Pump On/Off/Auto	Auto							
CO -	Compressor On/Off/Auto	Auto							
SS -	Sprinkler Air Pressure								
	Sprinkler Water Pressure								
V -	Sprinkler Valve Open/Closed	Open							
V -	Sprinkler Valve Open/Closed	Open							
V -	Sprinkler Valve Open/Closed	Open							
V -	Sprinkler Valve Open/Closed	Open							
Property Manager's Initials:									

Page 6 of ___

Daily Look / Listen / Touch Inspection Form

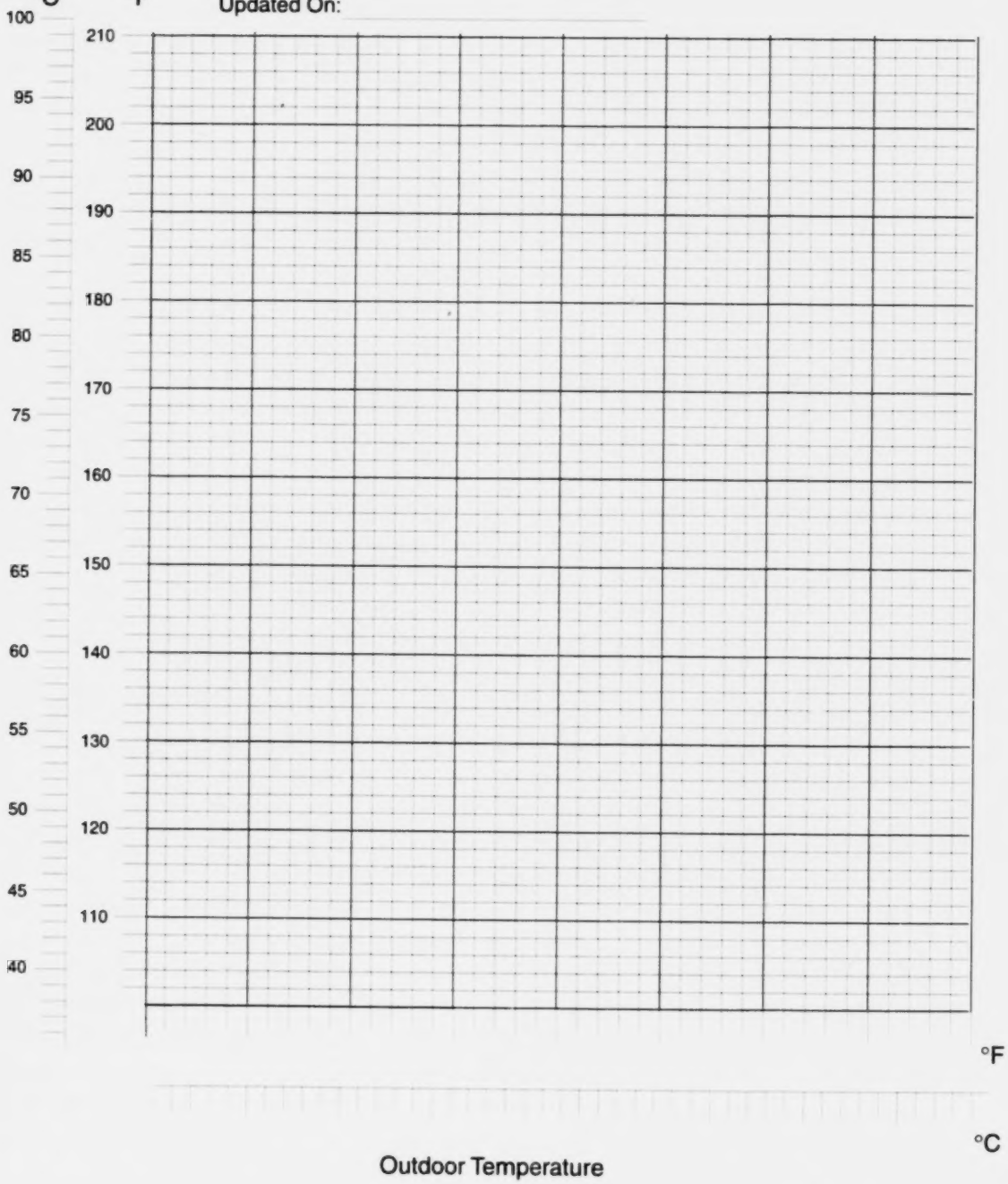
Building:	Starting Date (Mon):						
Operator:	Mon.	Tues.	Wed.	Thurs.	Fri.	Sat.	Sun.
Time of Inspection:							
System:							
Tag # / Reading Type / Range							
Property Manager's Initials:							

Page ___ of ___

Heating Water Temperature Curve

Building Name: _____

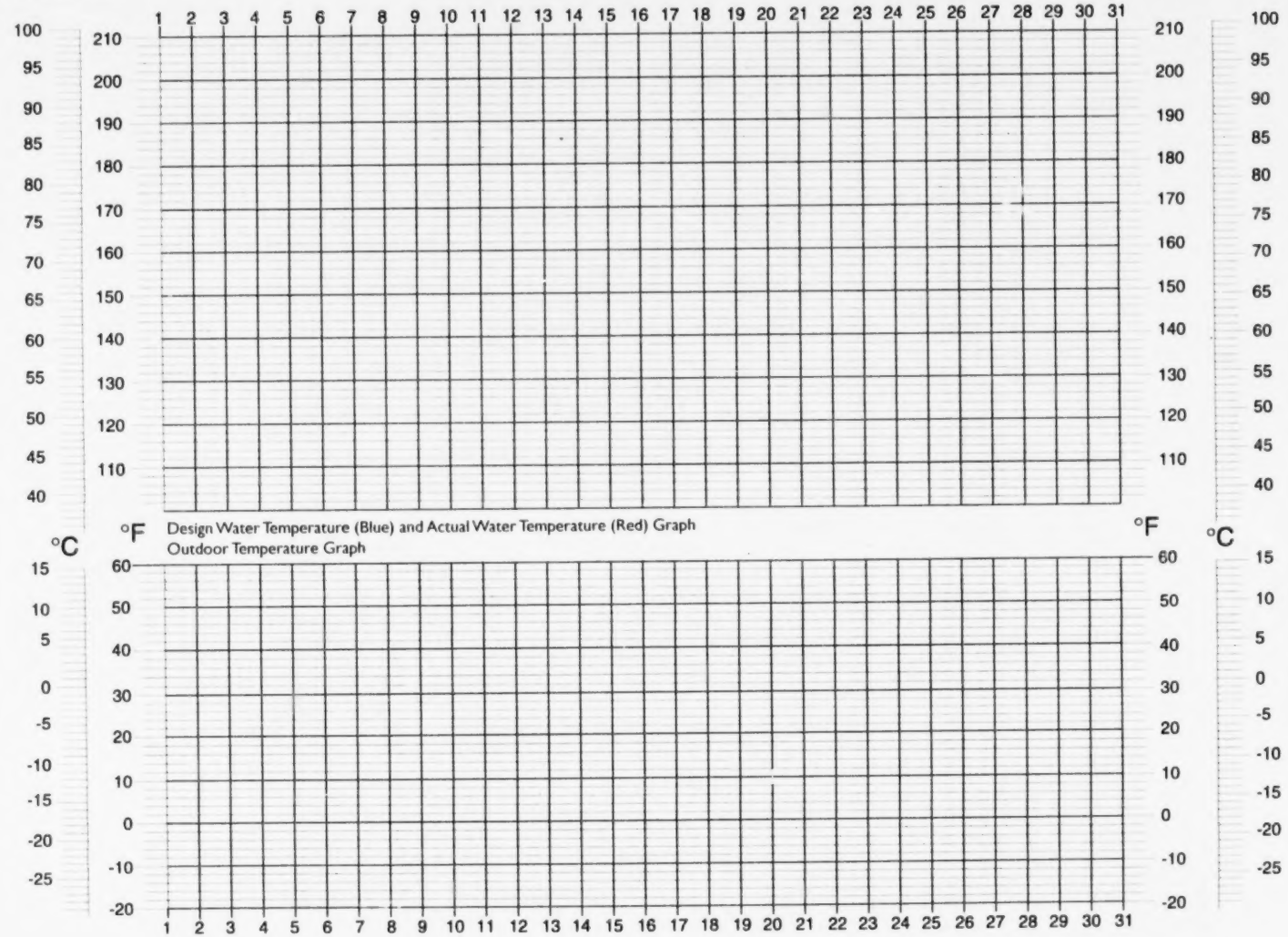
Updated On: _____



Building Name:

Month and Year:

Heating Water Control Graph



Maintenance Request Form
-- Heating --

Building Address:	Floor:	Home Phone:
Resident's Name:	Suite:	Work Phone:
Request:		
Request Received By:		Date:

I, the undersigned, hereby acknowledge that I requested the maintenance described below to be done in my apartment. I expect that this work will be completed as soon as possible. I authorized the management staff, or if necessary, a contractor to enter my apartment during reasonable hours in order to complete the work. Notwithstanding my absence from the apartment at the time of entry, my signature on this request form shall be my consent to enter my apartment to do the work described below. Should more than one visit be necessary to correct the problem I also give my consent.

Resident's Signature:	Date:

Resident: Please fill out the above information and submit to the Superintendent. Do not fill out beyond this point.

A. Conditions in the Suite (by Superintendent)

	YES	NO
1. Are the convector isolating valves fully open?	☐	☐
2. Is the suite valve free to turn?	☐	☐
3. Does the suite valve operate on demand from the thermostat?	☐	☐
4. The resident's thermometer reading is:	°C	
5. The setting on the thermostat is:	°C	
6. The thermometer reading on the thermostat is:	°C	
7. The Dry Bulb reading on the Sling Psychrometer is:		

	Living Room	Bedroom	
Dry Bulb	°C	°C	°C
Wet Bulb	°C	°C	°C

	YES	NO
8. Is any part of the convector blocked off by foil, paint, etc.?	☐	☐
9. Is there an air conditioner or sleeve installed in the suite?	☐	☐
10. Has weatherstripping been installed around the suite entrance door?	☐	☐
11. Are the exhaust vents in the kitchen and bathrooms operating properly?	☐	☐
12. Is there a humidifier in the suite?	☐	☐
13. Is there any heat-generating device near the thermostat (lamp, T.V., etc.)	☐	☐
14. Are there any noticeable cold air drafts from the balcony doors or windows?	☐	☐
15. Are the openings in the convector covers clear of all window drapes?	☐	☐
16. Are the convector fins free of dust and carpet lint?	☐	☐

B. Conditions in the Heating System

1. Boiler pressure	psi
2. Boiler supply temperature	°C
3. Boiler return temperature	°C
4. Building supply water temp.	°C
5. Building return water temp.	°C
6. Outdoor temperature	°C

Comments:

Inspected By:

C. Action (by Property Manager)

Action Taken	Number	Who to Correct	Date Issued
☐ Work Order			
☐ Purchase Order			

☐ Resident to be invoiced ? ☐ Insurance Claim #:

Work Authorized By:

Date:

Work to be Done:

Maintenance Request Form
-- Rainwater Infiltration --

Building Address:	Floor:	Home Phone:
Resident's Name:	Suite:	Work Phone:
Request:		
Request Received By:		Date:

I, the undersigned, hereby acknowledge that I requested the maintenance described below to be done in my apartment. I expect that this work will be completed as soon as possible. I authorized the management staff, or if necessary, a contractor to enter my apartment during reasonable hours in order to complete the work. Notwithstanding my absence from the apartment at the time of entry, my signature on this request form shall be my consent to enter my apartment to do the work described below. Should more than one visit be necessary to correct the problem I also give my consent.

Resident's Signature:	Date:

Resident: Please fill out the above information and submit to the Superintendent. Do not fill out beyond this point.

A. Conditions in the Suite (by Superintendent)

1. Which room is it leaking in?

2. Where is the leak in the room?
- Under window ☐ Above window ☐ Sides of windows ☐ At floor level ☐
- In corner of suite ☐ In closet ☐ At ceiling ☐
- On wall with no windows ☐ Outside wall ☐ Inside wall ☐

3. Which direction is the leaking area facing? East ☐ West ☐ North ☐ South ☐

4. Was there enough water to warrant using a wet Vacuum ☐ a Mop ☐ a cloth ☐

5. Is the leaking near hydronic piping/radiators? Yes ☐ No ☐

6. Is this the first report of problems? Yes ☐ No ☐

7. Does leak occur every time it rains? Yes ☐ No ☐

8. Is the leak near an air conditioning unit? Yes ☐ No ☐

9. Is the condensate drain pan full? Yes ☐ No ☐

10. Are there any uninsulated refrigerant lines? Yes ☐ No ☐

B. Inspection Comments: (by Superintendent)

Inspected By:

C. Expert's Comments:

Inspected By:

D. Action (by Property Manager)

Action Taken	Number	Who to Correct	Date Issued
☐ Work Order			
☐ Purchase Order			
☐ Resident to be Invoiced ? ☐ Insurance Claim #:			

Work Authorized By:

Date:

Work to be Done:

Maintenance Request Form
-- General --

Building Address:	Floor:	Home Phone:
Resident's Name:	Suite:	Work Phone:
Request:		
Request Received By:		Date:

I, the undersigned, hereby acknowledge that I requested the maintenance described below to be done in my apartment. I expect that this work will be completed as soon as possible. I authorized the management staff, or if necessary, a contractor to enter my apartment during reasonable hours in order to complete the work. Notwithstanding my absence from the apartment at the time of entry, my signature on this request form shall be my consent to enter my apartment to do the work described below. Should more than one visit be necessary to correct the problem I also give my consent.

Resident's Signature:	Date:

Resident: Please fill out the above information and submit to the Superintendent. Do not fill out beyond this point.

A. Conditions in the Suite

Inspected By:	Date:

B. Action Taken to Fix Problem

Problem Corrected By:	Date:

C. Recommended Action Required

Recommended By:	Date:

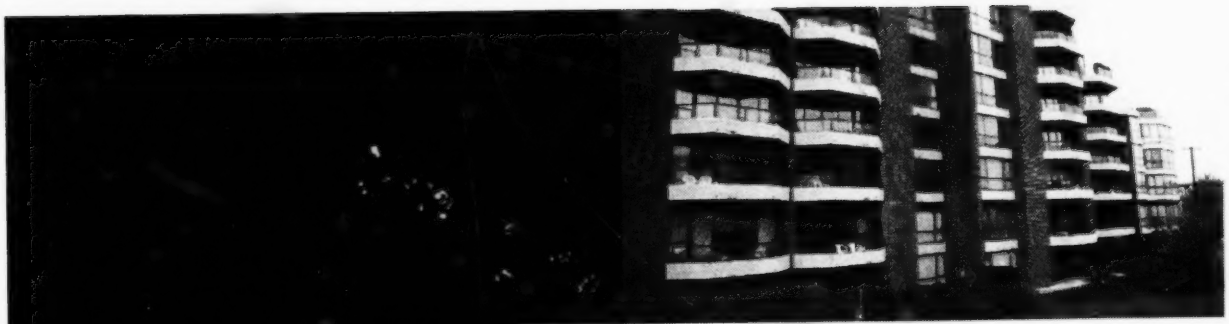
D. Property Manager

Action Taken	Number	Who to Correct	Date Issued
☐ Work Order			
☐ Purchase Order			
☐ Resident to be Invoiced ?	☐ Insurance Claim #:		

Work Authorized By:

Date:

Work to be Done:



SECTION 2.0

housekeeping

Section 2.0 Housekeeping

2.1 Introduction

Housekeeping involves indoor cleaning and maintenance. This section includes floor and carpet maintenance, pest control and general cleaning procedures.

2.1.1 Housekeeping Safety

Description: Housekeeping safety measures include:

1. Keeping storage areas, work areas and common areas clean and organized.

2. Using standard warning signs to alert people to slippery floor conditions when stripping, waxing or damp mopping.

3. Keeping all floor and baseboard surfaces clean, dry and free of protruding nails, splinters, loose boards, holes or projections.

4. Avoiding the use of cleaning materials or cleaning methods that might leave floors slippery. Oils are not suitable for rubber tile. Excessive use of ordinary wax for polishing wood, tile and similar surfaces is not recommended due to the slippery nature of wax. Cleaners are available for removing oils and wax. Volatile liquids such as gasoline should never be used.

5. Avoiding storing paints and cleaners, and other housekeeping products in the boiler room.

6. Removing promptly slippery materials spilled on floors.

2.1.2 Potentially Dangerous Household Products

Description: All potentially dangerous household products, bleaches, cleansers, floor polishers, etc. need warning signs. These products often contain dangerous chemical ingredients and if combined can form toxic gases. All containers for hazardous household products must provide the following information:

- hazard in symbols and words
- name of the hazardous chemical in the product
- what to be aware of
- necessary first aid treatment.

The most common hazard symbols for a multi-residential building are shown below in ***Figure 2.1.*** A more comprehensive list of symbols is available in WHMIS manuals. (See **1.4.1 WHMIS.**)

Figure 2.1 Hazard symbols.

Action

1. Keep the telephone numbers and addresses of a doctor, the nearest poison control centre, and the fire department near the telephone.

2. Ensure that all housekeeping products are labeled and stored in a secure location.

3. When phoning the poison control center, doctor or if going to the hospital, ensure the product container label is brought along.

2.2 General Floor Maintenance

2.2.1 Dry Mopping

Description: Dry mopping is effective in removing dust, dirt and litter. If the litter is especially heavy (for example, wood shavings), or the floor is rough (for example, unsealed concrete, heavily textured tile), use a push broom instead of a dust mop. Regular dry mopping prevents more serious floor defects, such as soil film and encrustations, and thereby prolongs floor life.

Action

1. Use a dry mop with a swivel head. Maintain a 45° angle as it passes in front of the operator.

2. Complete a straight side-to-side stoke, slightly overlapping the previous stroke.

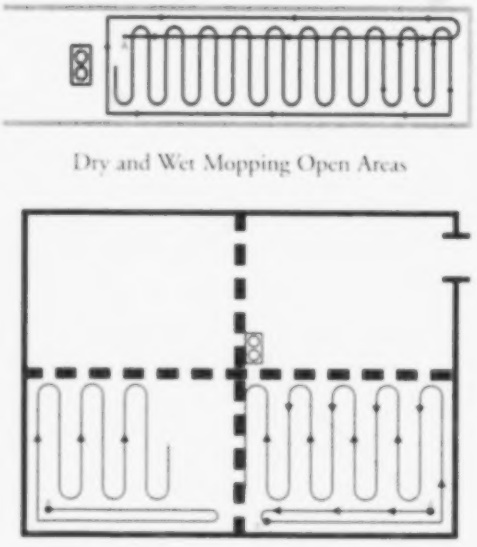
3. Ensure that the corners and sides of walls are mopped, as that is where dust accumulates.

4. Leave small piles of dirt in locations that are easy to sweep up. Do not, however, form piles of dirt in doorways or traffic ways.

5. Do not dry mop with a dirty or soiled mop head. Periodically, the mop should be shaken out.

6. Change the mop head when it becomes heavily soiled. Launder the mop heads as needed.

Figure 2.2 Dry and Wet Mopping Corridors



Dry and Wet Mopping Open Areas

2.2.2 Wet Mopping

Description: Wet mopping removes encrusted dirt and both wet and dry stains. This section describes the two-bucket system of mopping. The first bucket contains a detergent solution, and the second bucket contains clear water and

becomes the pick-up bucket. For better results, use a third bucket to collect waste solution and water. The best method of removing waste solution from the floor is to use a wet-pickup vacuum.

There are many types of detergents, and those used must be compatible with the floor type. The detergent manufacturer's information package should be consulted to ensure that the detergent can be used. Also, a small, inconspicuous area of the floor should be tested with the detergent to ensure that the floor surface will not be damaged.

Action

1. Dry mop the floor first, unless there is a wet spill that needs cleaning.

2. Mix the detergent solution to the proper strength. *Do not guess*—measure out the correct amount.

3. Using a wet mop, apply the mopping solution to a section of the floor. Allow five minutes for the chemical action.

4. Place a *wet floor* sign in the center of the area being mopped. Larger areas should have more than one *wet floor* sign.

5. Pick up the soiled solution and wring out the mop in the rinse water bucket.

6. Apply rinse water. Wait 5 minutes.

7. Pick up and wring out the soiled rinse water in the water bucket.

8. Replace the rinse water often so as not to spread dirt to clean sections.

2.3 Carpet Maintenance

This section covers regular carpet maintenance, including sweeping, vacuuming and stain removal.

2.3.1 Carpet Sweeping

Description: Light cleaning during times when quiet operation is essential. This will pick up most surface soil and small litter.

Action

1. Use a push-pull technique with the carpet sweeper.

2. Be sure to overlap each section of the carpet several times with the sweeper.

2.3.2 Carpet Vacuuming

Description: Carpets subject to heavy traffic should be vacuumed a minimum of twice a week. The following instructions are for an upright carpet vacuum cleaner:

Action

1. Adjust the head of the vacuum cleaner to the thickness of the carpet to achieve the most effective brush action.

2. When vacuuming, walk forward the full length of the cord. This forward operation picks up 40 per cent of the dirt.

3. Retrace the same distance in reverse. This reverse motion accounts for the remaining 60 per cent of the dirt removal.

4. Do not use extension cords, as this might result in the vacuum motor overheating and burning out.

5. Do not store the vacuum cleaner with dirt in the bag. The bag should never get more than half full.

2.3.3 Carpet Stains and Spills

Description: Most spills and stains can easily be removed by using a spot removal kit. This kit should include various solvents and instructions on how to remove stains of different types. The spot removal kit should be tested in an inconspicuous corner of the carpet to ensure that the solvents will not cause any damage. The following actions are general rules to follow when dealing with a spill or a stain. For difficult stains, a carpet cleaning professional should be contacted.

Action

1. Scrape, blot or absorb the excess of the spill immediately. The longer the spill remains on the carpet, the more difficult it will be to remove.

2. Use a dull knife or spoon to scrape semi-solid or greasy spills. Use paper towels for liquid spills.

3. Always work towards the center of the stained area to avoid spreading the spill.

4. Do not brush or rub the stained area. Always use a blotting or dabbing motion.

5. Identify the stain or spill as either i) oil or grease base or ii) water soluble in nature. Choose an appropriate solvent to remove the stain. Keep in mind that water-based solvents will not dissolve oil-based stains and vice versa.

6. Place a small amount of cleaning solvent on a clean, white, absorbent cloth. Blot the stained area with the cloth. *Do not rub or brush.* Also, do not get the carpet too wet, as this will soak the carpet backing and cause further damage.

7. Repeat step 6 until no more spill material can be lifted. Be patient, as some stains require time to remove.

8. After most of the spill has been absorbed, place a fresh pile of paper towels over the spilled area and place a flat weight on the towels while the area dries. Allow six hours for drying, if possible.

Note: Carpet stain removers that contain organic solvents should only be used in adequately ventilated areas.The maintenance staff should wear gloves and masks with organic vapor filters. If proper ventilation cannot be provided, the carpet should be removed and taken to a ventilated area for cleaning, in order to safeguard the health of the building occupants.

Carpets that have become wet due to rainwater penetration should be dried as soon as possible. Wet carpets quickly become moldy and can damage the sub floor as well. Commercial carpet drying equipment is available. If the carpet has been wet for some time and is moldy, it should be replaced.

2.4 Pest Control

Description: Pests include unwanted insects, rodents, birds and bats. Often their presence indicates unsanitary or damp conditions. Minor pest problems can usually be dealt with by improved housekeeping procedures and

preventative measures. Pest control problems should be handled by a professional pest control service. Most owners engage a professional pest control service as a warranty can be obtained for the work.The use of pest control chemicals often requires that the person doing the application be trained in their use and storage.

The best way to deal with pests is to prevent them from entering the building. This involves ensuring that all doors and windows are tightly fitted and sealed; window screens are in good repair. Sealing potential entryways through the building envelope will also prevent the entry of pets. Such pathways include gaps around plumbing mechanical and electrical services, bathroom and kitchen vent hoods, cracks in siding and foundations—DO NOT SEAL WEEP HOLES IN MASONRY WALLS piping penetrations and electrical service through the ceiling of underground parking garages. Attic vents should have screens that are checked annually to ensure they are in good repair.

Secondary preventative measures for pest control include:

Action

1. Ensure that there is no food or shelter for pests. Promptly and properly dispose of all debris and trash. Remove all weeds and unwanted plant growth adjacent to the building. If the pest problem occurs in an apartment, ensure that the occupants are aware that pests are attracted by food and shelter. Food should not be left out, garbage should be disposed of regularly, clutter should be minimized under counters and cabinets.

2. Maintain clean, uncluttered storage areas—especially garbage rooms and the garbage chute.

3. Use anticoagulant baits and rat or mousetraps to control rodent infestation.

4. Fill out a ***Maintenance Request Form*** and forward to the property manager if pest control becomes a serious problem.

Note: Any methods taken to control pests should consider the potential impact of the pesticides used on the health of the building occupants. Priority should be given to non-chemical methods of pest control. If additional steps are needed, integrate pest management techniques that minimize the use of chemical pesticides.

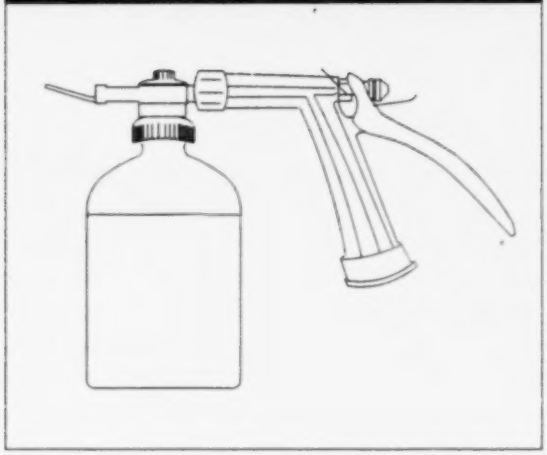
Cockroaches are the most common problems in apartment buildings. Infestations are not easily controlled with pesticides partly because cockroaches develop a resistance to the chemicals. The migration of cockroaches between apartments can be prevented by caulking and sealing plumbing, baseboards and other penetrations into the apartments prior to the application of pesticides. At the same time, tenants should be advised to keep their apartments scrupulously clean, not to leave food out and to use commercially available roach traps within their units.

2.5 General Cleaning

Soaps, detergents or cleaners can handle most cleaning jobs; however, some cleaning jobs require disinfections or germicidal cleaning with the right fluid. For heavy germicidal cleaning, a degreasing gun should be used.

The gun is a plastic bottle which screws onto the end of a garden hose spray gun. The cleaner fluid is dispensed when water is sprayed

Figure 2.3 Degreasing Gun



2.5.1 Garbage Compactor Containers

Description: After the garbage compactor containers are emptied and **deactivated**, they should be cleaned:

Action

1. Fill the plastic bottle with a full-strength germicidal cleanser.
2. Set degreasing gun spray at 15 cm^3 of cleanser per liter of water.
3. Spray the inside of the container thoroughly. Use hot water if available.
4. Use a stiff bristle brush to loosen any soil that may be stuck to the side of the bin.
5. Set the spray to 100 per cent water and rinse out. It is very important and necessary to rinse with 100 per cent water when using a germicidal cleanser.
6. The containers should be thoroughly cleaned with a power washer and a scraper on an annual basis.

2.5.2 Garbage Storage and Compactor Rooms

Description: The following steps should be used to clean the garbage storage and compactor rooms:

Action

1. Fill the degreasing gun plastic bottle with a full-strength germicidal cleanser.
2. Set the degreasing gun spray at 15 cm^3 of cleanser per litre of water.
3 Always spray the walls from the floor up, so that the germicidal cleanser only runs on surfaces that are already wet.
4. Spray the inside and the outside surfaces of the garbage compactor thoroughly, using hot water, if available.
5. Use a stiff bristle brush to loosen any soil that is stuck.
6. Spray clean with fresh water.
7 Spray the floors, walls and ceiling of the room with a degreasing gun, using hot water if available.

2.5.3 Garbage Chute

Description: The garbage chute should be disinfected as follows.

Action

1. Fill a pail with 15 cm^3 of germicidal cleanser per liter of water.

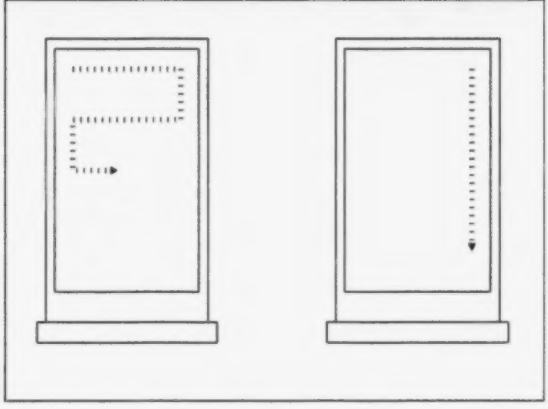
2. Pour one pail of solution down the chute every nine floors, beginning at the top down. Attempt to soak the total inner surface of the chute.

3. Open the flushing ring to flush the chute. Use hot water if possible.

2.5.4 Interior Glass Cleaning

Description: Generally, a window-washing contractor is used to wash inaccessible windows. However, the building staff should keep the accessible windows clean in public areas and lobbies.

Figure 2.4 Effective Squeegee Motions



Action

1. Prior to using a new brand of window cleaner, spray a very small amount in an inconspicuous location on surrounding building finishes. After the cleaner has dried, inspect the finish to ensure that no damage or staining has occurred. If damage or staining has occurred, use a different window cleaner.

2. Apply a little window cleaner to the glass using a vertical spray motion. Avoid using too much window cleaner.

3. Use a cloth pad or sponge to spread it over the rest of the glass area.

4. Rub the glass with the cloth pad (or paper towel) until the cleaner dries.

5. Instead of **step 4**, a squeegee may be used to remove the excess solution. Wipe the blade of the squeegee with a cloth or sponge after each stroke. (See ***Figure 2.4***)

2.5.5 Showers and Washrooms

Description: Public washrooms should be cleaned and maintained on a *daily basis.* Suite washrooms should be cleaned before new occupancy. Most often, the use of a degreasing gun is impractical in toilets. Instead, use a hand spray bottle. When cleaning toilets, ALWAYS wear rubber gloves.

Action

1. Use 30 cm^3 of germicidal cleanser per liter of water in a hand spray bottle for all walls and floor areas.

2. Clean all surfaces with a sponge before rinsing them off with hot water.

3. Scrub the wall and floor areas with an abrasive scrub pad to prevent scum build up.

4. Spot-clean walls, partitions and doors. Check areas where dust and dirt are likely to collect.

5. Clean outside of the toilet tank and all washbasins, faucets and counter-tops with a suitable cleaner.

6. Empty all waste bins and receptacles.

7. Clean the floors thoroughly using a dry mop if necessary.

8. Check and refill dispensers for toilet tissue, hand towels, etc. Make sure each dispenser is working properly.

9. Clean all mirrors and glass.

10. Clean all hardware and pipes, especially those under the sinks. Also, clean the underside of sinks and tanks.

11. Clean the top and the bottom of the toilet bowl with a sponge and toilet bowl cleaner.

TIP: Cleaning toilets offers the opportunity to ensure that the toilet is working and is not leaking. Listen for water leakage or other sounds from the tank or movement of water in the bowl. Leaking tanks may have to have the flapper assembly replaced or the float valve adjusted.

TIP: Beware of chlorine-based "automatic" toilet water cleaning products that are used in toilet tanks. They should not be used as the chlorine causes the toilet tank assemblies to leak or fail all together.

2.5.6 Saunas

Description: The sauna should be cleaned daily if it is used daily.

Action

1. Spray the whole sauna room with a degreasing gun set at 15 cm^3 of germicidal cleanser per liter of hot water.

2. Let it stand for one minute.

3. Scrub the area with an abrasive hand pad.

4. Rinse the area with clean water.

5. Scrub the floor of the sauna with a thick bristle brush.

2.5.7 Graffiti Removal

Description: Usually graffiti are markings of ballpoint ink, crayon, lipstick, magic marker, pencil and heel marks on floors. Remove graffiti by using graffiti mark and stain removal product. The sooner the marks are cleaned, the easier they will be to remove.

Action

1. Wet the marked area with clean water.

2. Apply the graffiti remover using a clean cloth. Turn the cloth frequently to avoid smudging.

3. Wipe softly and allow enough time for the graffiti remover to penetrate the stain.

4. Use a separate clean cloth to wipe the marked area with clean water. Always use a clean water rinse after applying the graffiti remover.

Exterior graffiti removal requires the services of a specialized contractor. The chemicals and procedures used depend on the type of paint and the surface to be cleaned.

2.5.8 Spot Cleaning and Dusting

Description: Small cleaning jobs can become big ones without regular day-to-day spot cleaning and dusting.

Action

1. Carry a spray gun with a mixture of 15 cm^3 of all-purpose cleanser per liter of water.
2. Use the cleaning mixture to remove spots on walls, woodwork and ceramic tiling and paneling.
3. Spray the solution on a cleaning cloth to wipe off entrances to apartments, elevator cabs and the control panels.
4. Remove dust from surfaces using a damp cloth.

2.5.9 Metal Cleaning

Description: Metal can be scarred or corroded if incorrect cleaners are used. Cleaning of metal surfaces will include:

Light Cleaning

Action

1. Wipe metal surfaces clean using a soft cloth or a slightly damp cloth. Do not use detergents.
2. Polish with a clean, soft cloth until the surface is free of marks and smears.
3. If the surface is still dirty, follow ***Heavy Cleaning*** instructions.

Heavy Cleaning

Action

1. Use a commercially available polishing agent or metal cleaner. Read the instructions to ensure that the agent or cleaner can be used on the metal. Generally, an abrasive material or cleaner should not be used.
2. Prior to using a new cleaning brand, spray a very small amount in an inconspicuous location on the surface and polish. Inspect the finish to ensure that no damage or staining has occurred; if so, use a different brand.
3. The following chart lists cleaners that are compatible with different finishes:

Finish	Appropriate Cleaner
Aluminum	Mild Soap; Solvent Cleaner; Mild Abrasive Cleaner
Brass/Bronze	Brass Polish
Chromium/Nickel Coating	Neutral Cleaner; Alkaline Cleaner with Corrosion Inhibitor
Other Non-Ferrous* Metals	Mild Soap; Very Mild Abrasive to remove Tarnish
Stainless Steel	Detergent; Polishing Powder and Cloth. When removing scratches, rub in the direction of the scratch. Do not use metal brushes or steel wool, as they can cause the stainless steel to rust.
Lacquered Metal	Mild Soap or Detergent.

* Metals not containing Iron (all steels contain iron)

4. Rinse thoroughly after using a cleaner, and dry the metal.

2.5.10 Recycling Bins

Description: Recycling bins should be cleaned at least monthly. The requirements are not as stringent as with garbage compactor containers, since material for recycling is comparatively clean. The best time for a cleaning will be immediately after a recycling pickup.

Cleaning

Action

1. Wet mop the inside of the bin with an industrial-strength disinfecting cleaner. Leave top open for half an hour to allow drying.

2. In heavily soiled situations, use the same process as with garbage compactor containers.

Keeping Clear

Action

1. Do not allow parking in front of bins at any time. Post "No Parking" signs clearly indicating areas to be kept clear. Put warning notes on offending vehicles.

2. Report repeat offenders to the property manager.

2.6 Apartment Cleaning

Description: Apartment cleaning is required before a new tenant moves in. The following is a list of items to be checked and cleaned within the suite. Refer to the specific sections of this manual for further details.

Housekeeping

1. Remove and discard anything left from the previous tenants.

2. Clean light fixtures.

3. Clean mirrors, windows, windowsills and window frames.

4. Clean shears and blinds.

5. Clean cupboards (especially the top), drawers, shelves and closets.

6. Clean floors, walls, ceilings, counter tops, etc. If repainting or other repairs are required, fill out a ***Maintenance Request Form*** and forward it to the property manager.

7. Clean washrooms. (See ***2.5.5 Showers and Washrooms***) Re-caulk bathtub or tiles as required.

8. Clean inspect kitchen range hood filter and bathroom fan grills. Confirm that air is being exhausted.

Structural, Architectural and Hardware

Description: The following points address structural, architectural and hardware issues such as windows, sliding doors, locks etc.

Action

1. Check all sliding doors, windows and screens for damage and proper operation. Make sure all door and window stops are installed and working properly. Replace worn air sealing gaskets.

2. Oil all hinges with an all-purpose oil.

3. Change the lock on entrance door.

4. Perform necessary drywall repairs and touch-up painting.

Electrical and Appliances

Description: Check and clean appliances thoroughly.

Action

1. Replace burned-out light bulbs and defective ballasts.

2. Clean all cover plates. Replace cracked or missing plates.

3. Check receptacles for proper wiring. (See ***5.4 Wall Receptacles***)

4. Thoroughly clean the stove, including stove fixtures, the pan drawer, the oven, and underneath and behind the stove. Replace the broiler pan if it is damaged or missing. Replace oven heating elements if excessively warped.

5. Check the operation of the stove, refrigerator and other appliances. (See ***5.8 Appliances***). Check the operation of ground fault interrupter on electrical outlets. Have ground fault indicator (GFI) units where required if this has not already been done.

6. Thoroughly clean the refrigerator, including shelves, crisper drawers, kick plate, door seal, and defrost tray. Vacuum condenser coils (behind or underneath the refrigerator). Replace egg trays, butter trays, or ice cube trays as needed. Clean the condensate drip pan that is usually located under the refrigerator.

7. Check the operation of the refrigerator. (See ***5.8 Appliances***)

8. If the suite will be unoccupied for an extended period, unplug the refrigerator, and prop the doors open.

9. Check the operation of the dishwasher and any other in-suite appliances. (See ***5.8 Appliances***)

Fire Protection

Description: The inspection of fire protection devices is a high priority.

Action

1. Inspect, test and vacuum the smoke alarm and the smoke detector—replace the battery.

2. Check that the door closure is capable of closing the entrance door.

3. Visually check all fire protection devices.

Plumbing and Drainage

Description: Checking for proper drainage and inspecting kitchen and bathrooms for leaks will reduce the chance of major plumbing problems later.

Action

1. Change washers and O rings in all taps.

2. Check the operation of toilets for leakage and proper functioning.

3. Remove and clean faucet aerators.

4. Check that sink and tub stoppers do not leak. Replace or repair as required.

5. Check the temperature on in-suite hot water heater. If necessary, reset to between 50°C and 60°C.

Heating, Cooling and Ventilation

Description: Complete inspection of heating, cooling and ventilation.

Action

1. Check the operation of the heating system. Test thermostat. Dust and vacuum baseboard heaters. Change filters on fan-coil units.

2. Check the operation of the air conditioning system. Clean condensate pans and vacuum coils.

3. Clean the exhaust fans and the exhaust fan grills. Confirm airflow occurs.

Security and Communication

Description: All security considerations should be checked after vacancy of unit.

Action

1. Check the operation of the intercom system.

2. Check the security chains on the suite door, the locks and the stops on the balcony doors and the locks on the bathroom doors.

Cleanup After a Death

Description: Immediate attention to cleaning the unit after it has been vacated will address any cleaning issue problems.

Action

1. Notify the property manager of the situation. The property manager will notify next of kin, giving them time to remove personal belongings.

2. Once the next of kin have removed the belongings, clean the suite as with any other vacancy.

4. If there are organic stains on the carpet, steam clean using a carpet shampoo recommended specifically for these types of stains. If that is unsuccessful, use a ***Maintenance Request Form*** to notify the property manager that a section of carpet will have to be replaced.

Drywall Repairs and Touchup Painting

Description: Inspect and determine if the services of a drywall contractor is needed or if experienced onsite staff can do the job.

Action

1. Using a professional grade drywall compound, spackle the walls to fill holes smaller than a quarter.

2. For larger holes, cut the hole to an even square or rectangle. Cut a matching piece of drywall from a spare sheet, to fit snugly into the opening. Spackle the edges with drywall compound.

3. Large holes will need replacement of an entire sheet of drywall. This may require the services of a drywall contractor. If the onsite staff is experienced in this they can remove the old sheet, mount the new sheet, and tape the edges using drywall tape and compound. Otherwise, forward a ***Maintenance Request Form*** to the property manager.

4. Sand all repairs to a smooth finish.

5. Paint repaired areas with a latex primer. Allow one hour to dry before the application of the final paint finish or as directed by the manufacturer.

6. Paint repaired areas to match surrounding wall.

Storage of Tenant Belongings

Action

1. If a tenant has left behind any items of value, store them in a safe place for 30 days.

2. During the 30 days, make at least two attempts to contact the owners. Record the dates and times of the attempted contacts.

3. Dispose of the items appropriately after the 30-day period.

2.7 Common Area Lamp Replacement

Description: In residential buildings, lamps located in common areas are replaced as they fail. This can be done in one of two ways:

1. By cleaning staff, who carry spare lamps with them on their rounds.

2. By the Superintendent as he notices failures during his ***Look/Listen/Touch Inspections.***

To avoid electrical shock, turn off the light at the switch or circuit breaker before changing the lamp. Lamp lenses and reflectors should be cleaned when bulbs are replaced.

Further Reading

The Institute of Real Estate Management, **The Resident Manager: On-Site Management Handbook for Apartments and Condominiums**, *The Institute of Real Estate Management*

Liska, Roger W., PE, **Means Facilities Maintenance Standards**, *R.S.Means Company Inc.*

Ontario Government - Ministry of Housing, **Planned Maintenance Manual**, *Queen's Printer for Ontario*

Ontario Government, **A Guide to the Occupational Health and Safety Act**, *Queen's Printer for Ontario*

Ontario Government, **A Guide to the Window Cleaning Regulation**, *Queen's Printer for Ontario*

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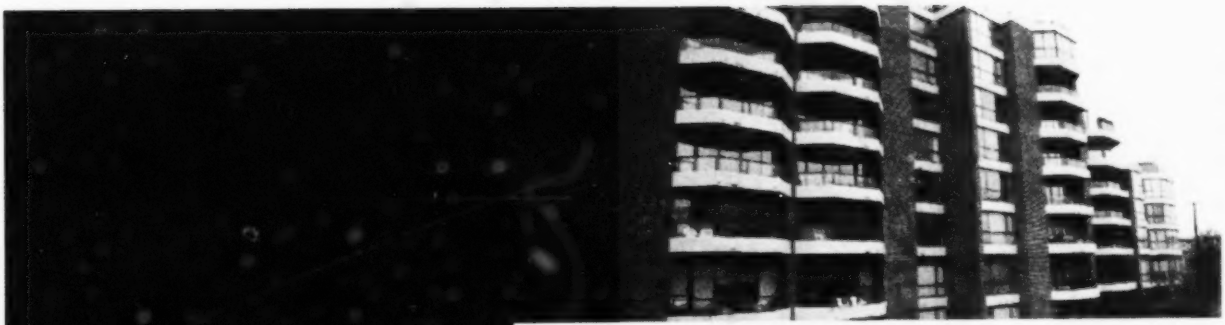
Resident Managers' Training Institute, **Apartment & Condominium Operators' Manual**, *Resident Managers' Training Institute*

Shear, Mel A., **Handbook of Building Maintenance Management**, *Prentice-Hall Inc.*

Shear, Mel A., **Property Management Reinvented; How to Convert Maintenance and Energy Expenses to Profits**, *Prentice-Hall Inc.*



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Maintenance Request Form
-- General --

Building Address:	Floor:	Home Phone:
Resident's Name:	Suite:	Work Phone:
Request:		
Request Received By:		Date:

I, the undersigned, hereby acknowledge that I requested the maintenance described below to be done in my apartment. I expect that this work will be completed as soon as possible. I authorized the management staff, or if necessary, a contractor to enter my apartment during reasonable hours in order to complete the work. Notwithstanding my absence from the apartment at the time of entry, my signature on this request form shall be my consent to enter my apartment to do the work described below. Should more than one visit be necessary to correct the problem I also give my consent.

Resident's Signature:	Date:

Resident: Please fill out the above information and submit to the Superintendent. Do not fill out beyond this point.

A. Conditions in the Suite

Inspected By:	Date:

B. Action Taken to Fix Problem

Problem Corrected By:	Date:

C. Recommended Action Required

Recommended By:	Date:

D. Property Manager

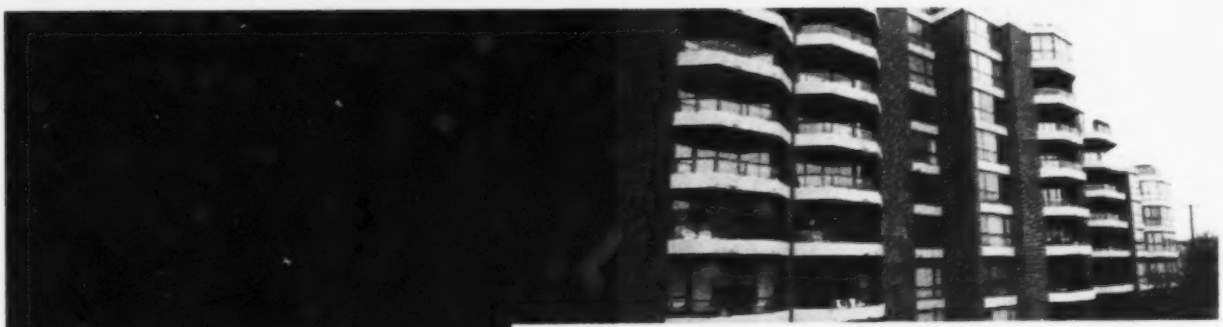
Action Taken	Number	Who to Correct	Date Issued
☐ Work Order			
☐ Purchase Order			

☐ Resident to be Invoiced ? ☐ Insurance Claim #:

Work Authorized By:

Date:

Work to be Done:



SECTION 3.0

grounds keeping

Section 3.0 Grounds Keeping

3.1 Introduction

Grounds keeping is the maintenance of outdoor property. This section covers snow and ice removal, lawn care, fertilization (lawn, trees and shrubs), weed/pest control and pruning.

3.1.1 Grounds Keeping Safety

Description: Safety measures for grounds keeping include:

Action

1. Removing snow and ice on sidewalks and entrances as it is a hazard to occupants and visitors. Shovels, ice scrapers or snow blowers should be used to clear snow and ice from sidewalks as quickly as possible.

2. Removing ice and icicles from overhangs, canopies and roofs. Areas with continuous formation of icicles should be fenced off with snow fences, and warning signs should be put in the area. Icicle formation is usually a symptom of an underlying problem such as air leakage, inadequate insulation and ventilation in an attic space. Fill out a ***Maintenance Request Form*** and forward it to the property manager to resolve the problem.

3. Snow and ice should be piled on lawns rather than pushed onto the streets. A chemical ice remover is preferable to sand for use on icy areas around the entrance, as sand will be tracked into the building. *Salt is corrosive—avoid using it if possible.*

3.2 Lawn Care

Lawn care involves mowing, watering, aerating, fertilizing and removing litter. Appearance standards will vary, but will generally depend upon lawn traffic and lawn purpose.

3.2.1 Lawn Mowing

Description: Grass should never be allowed to grow more than 75 mm high. Also, mowing should never cut the grass to less than half its height. Generally, a lawn should be mowed once a week but will depend on the amount of rain. The best time to mow the lawn is in the morning or in the evening.

Preparation

Action

1. Wear steel toe safety boots and hearing protection while operating the lawn mower and motorized edge trimmers.

2. With the lawn mower off, check that the blade is sharp and tightly on the shaft. (Electric mowers should be unplugged.) Debris should be removed from under the blade housing.

3. Check the level of gasoline, fuel oil (two-stroke engines) and lubricating oil (four-stroke engines).

4. Check that all safety mechanisms, such as the automatic shut-off bar, are working properly.

5. Collect all garbage and twigs from the lawn prior to cutting.

Lawn Mowing

Action

1. Cut three swaths around the perimeter of the lawn, so that the clippings are blown back into the centre of the lawn. (See Figure 3.1)

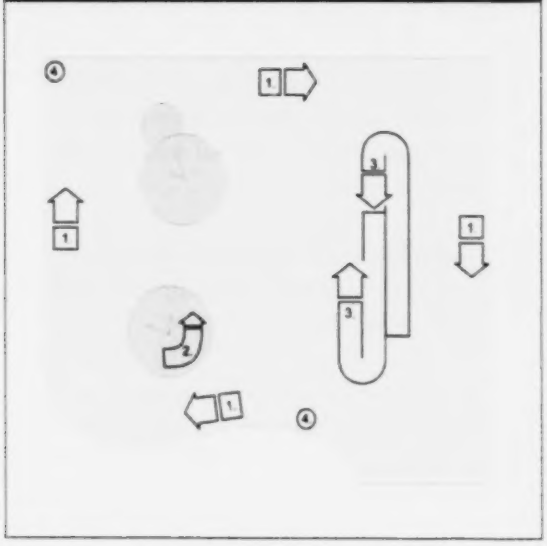
2. Cut around trees, shrubs and other obstacles.

3. Cut the rest of the lawn in an alternating up and down direction. Change the pattern each week. (for example north to south one week and then east to west the next week)

4. Neatly edge and trim all sidewalks, driveways, planted areas, building edges, etc.

5. Avoid hitting trees with lawnmowers and edge trimmers as this can weaken the tree and even kill it.

Figure 3.1 Recommended Mowing Pattern



3.2.2 Watering

Description: Deep watering a lawn encourages deep root growth. Deep watering once a week is far more effective than a light sprinkling several times a week. The average sprinkler discharges 20 L of water per minute over an area of 95 m^2. This translates to two hours of watering producing 25 mm of water.

Action

1. For average soil, in the first week of the growing season, water the lawn with about 75 mm of water or for approximately six hours.

2. Thereafter, water the lawn once a week to about 35 mm.

3. Step 2 might require more or less water depending on the grass and weather conditions.

4. Ensure that all areas are watered equally. Hand water hard to reach areas as required.

5. Do not over water during rainy weather. Turn the sprinkler systems off as weather dictates.

6. Watering is best done early in the morning.

3.2.3 Fertilizing

Description: The necessary fertilizing for lawns depend on the type of soil, the type of grass and the climate. An exterior maintenance plan should take these factors into account. There are three basic compounds that plants need most: Nitrogen, phosphorous and potash.

These are supplied in fertilizers, and their amounts are given as percentages. For example, 10-6-4 fertilizer contains 10 per cent nitrogen, 6 per cent phosphorous and 4 per cent potash. A 45-kilogram bag of 10-6-4 fertilizer would contain 4.5 kilograms of nitrogen.

The use of organic fertilizer is limited due to high storage, transportation and handling costs. However, they are more environmentally friendly and may be used in some instances.

The following actions are rules of thumb for lawn fertilization:

Action

1. Generally, grass requires one kilogram of nitrogen per 200 square meters, per month.

2. Divide the application of fertilizer into two or three applications per year.

3. The best time to fertilize is during the growing season. For two applications per year, apply one in early spring and the second in early fall. For three applications, apply in early spring, late spring, and early fall.

4. Always water the lawn after fertilizing.

3.3 Tree and Shrub Care

Tree and shrub care involves cultivating and edging, watering, fertilizing and pruning.

3.3.1 Cultivating and Edging

Description: Trees and shrubs need to be cultivated and edged to stay healthy.

Action

1. Maintain a pit around all trees and shrubs. Tree pits should be 1m in diameter. Shrub pit sizes will vary with the plant size.

2. Remove grass and weeds from the pit.

3. Cultivate the pit to a depth of 50 mm using a hoe or a garden claw.

4. Install mulch (such as shredded bark) over the pit area to a depth of 50 mm. Ensure the mulch does not contact the tree bark. The mulch will aid in retaining water in the area, while discouraging weed germination.

5. Edge the pit with a hand edger. This prevents grass growth.

3.3.2 Watering

Description: Trees and shrubs generally require less water than lawn. They need only enough water to stay healthy, without damaging their roots. Young or newly planted trees require more watering than established trees to encourage growth.

Action

1. Do not water tree or shrub pits if they are wet or have puddles.

2. Water the tree pits thoroughly for 10 minutes, using an open hose.

3. Water the shrub pits to maintain moist, not wet, soil conditions.

3.3.3 Fertilizing

Description: Trees, shrubs and hedges need 5-10-5 or 6-10-4 fertilizer. (See section 3.2.3) Be sure to use a recommended fertilizer for the specific plants.

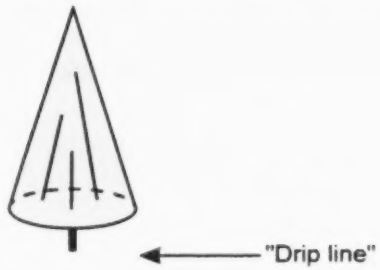
Action

1. Measure the diameter of the tree 30 cm from the ground.

2. Use 1 kg of fertilizer per 5 cm of diameter.

3. To apply fertilizer to the tree pit, punch holes with a crowbar about 45 cm deep at 1 m spacing along the drip line as shown in ***Figure 3.2.*** Backfill holes with fertilizer and cover.

Figure 3.2 Tree Drip Line



4. For large trees, (greater than 20 cm in diameter) punch holes every 1 m along a circular path 1 m inside the drip line, in addition to those along the drip line. Stagger the holes in the two circles.

5. Measure the height of the shrubs.

6. Add fertilizer according to shrub height and diameter.

Height/Diameter	Fertilizer Amount
1.2 m or less	0.45-0.7 kg
1.2 to 1.8 m	0.90-1.10 kg
1.8 m or more	1.4 kg

7. Scatter the appropriate amount of fertilizer at the base of the shrubs, and work it into the soil and then water the shrub.

3.3.4 Pruning

Description: Trees should be pruned to thin out an overly dense crown, to shorten long or weak limbs, and to remove dead, dying, or injured branches. Shrubs and vines should be pruned to develop a desirable shape. Depending on the plant, one to three trimmings may be required each growing season. Poor pruning can ruin or kill trees and hedges, therefore it is suggested that only experienced personnel attempt to do this. Use tools that are sharp and that make a clean cut.

Action

1. Start to shape trees at planting time.

2. Diseased, dead or broken branches should be removed when they are first noticed. Be sure the branch is dead and not dormant.

3. Do not leave stubs or ragged cuts.

4. If two branches are rubbing, prune the weaker branch.

5. Always cut back to another branch or bud. If the end of the branch is dead, cut beyond it and close to a bud.

6. Remove suckers at the base of trees by pulling them out. Cutting them encourages more growth.

7. Branches should be cut so that only a small stub is left. Problems occur when the branch is cut too close to the trunk or too long of a stub is left.

3.4 Weed Control

Description: A serious weed problem indicates poor grass growth or unsuitable soil conditions. The soil must be improved before resorting to control of weeds with herbicides. Spot control of the weeds uses less chemicals than broadcast applications. If chemicals must be used, fill out a ***Maintenance Request Form*** and forward it to the property manager. All guidelines and regulations, including posting of notices, should be followed and can be obtained from provincial Ministries of the Environment. It is advisable to leave it to an experienced lawn care contractor.

Generally, the best method of weed control is to follow proper routine maintenance of the lawn and garden beds (see sections 3.2 and 3.3). There are other methods for weed control, including mowing, aerating, chopping, burning, tilling the soil and planting the area with superior vegetation. Consult a weed-control specialist at a local lawn and garden supply store to determine the best course of action.

Action

1. Remove weeds by hand. Make sure that the root of the weed is also removed.

2. If weeds persist, control weeds by using spot applied herbicide. Fill out a ***Maintenance Request Form*** and forward it to the property manager.

3.5 Plant Diseases, Insects and Pests

Description: Generally, the best method of disease, insect and pest control is to follow proper routine maintenance on the lawn and garden beds (see sections 3.2 and 3.3). Plants maintained in vigorous growing conditions are less susceptible to disease. Proper fertilization, protective spray programs and adequate water are the basic requirements to prevent disease, insects and pests.

If plant diseases, insects and pests persist, fill out a ***Maintenance Request Form*** and forward it to the property manager.

3.6 Ice Melting Substances

Description: In most parts of the country, ice-melting substances will have to be used on walkways and stairs. Such substances should be used sparingly, and applied only to the walking traffic areas. Apply the material without delay when an ice buildup is noticed.

Salt is very effective, but is most damaging to pavement and to surrounding grass and shrubbery. Excessive use of salt can damage adjacent masonry and concrete surfaces, and create a hostile saline soil that burns plant roots.

Calcium and ammonia-based ice melting substances are more expensive and somewhat less effective, however they will not damage plant life to the same extent. In fact, the ammonia alternatives will enrich the soil.

Sand can be used during warmer periods when ice is expected to melt. It is inexpensive and will not harm asphalt or plants but can lead to increased cleaning requirements for adjacent foyer and lobby areas.

Further Reading

The Institute of Real Estate Management, **The Resident Manager: On-Site Management Handbook for Apartments and Condominiums**, *The Institute of Real Estate Management*

Liska, Roger W., PE, **Means Facilities Maintenance Standards**, *R.S.Means Company Inc.*

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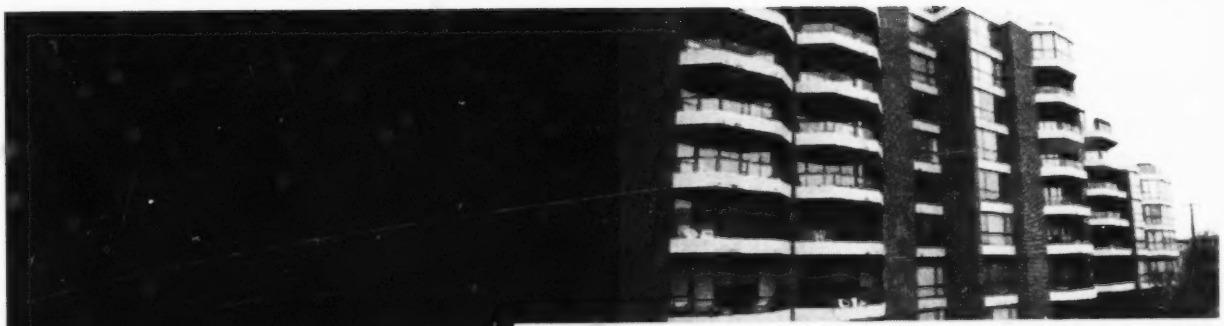

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Maintenance Request Form
-- General --

Building Address:	Floor:	Home Phone:
Resident's Name:	Suite:	Work Phone:

Request:

Request Received By: | Date:

I, the undersigned, hereby acknowledge that I requested the maintenance described below to be done in my apartment. I expect that this work will be completed as soon as possible. I authorized the management staff, or if necessary, a contractor to enter my apartment during reasonable hours in order to complete the work. Notwithstanding my absence from the apartment at the time of entry, my signature on this request form shall be my consent to enter my apartment to do the work described below. Should more than one visit be necessary to correct the problem I also give my consent.

Resident's Signature: | Date:

Resident: Please fill out the above information and submit to the Superintendent. Do not fill out beyond this point.

A. Conditions in the Suite

Inspected By: | Date:

B. Action Taken to Fix Problem

Problem Corrected By: | Date:

C. Recommended Action Required

Recommended By: | Date:

D. Property Manager

Action Taken	Number	Who to Correct	Date Issued
☐ Work Order			
☐ Purchase Order			

☐ Resident to be Invoiced ? ☐ Insurance Claim #:

Work Authorized By:

Date:

Work to be Done:

SECTION 4.0

building envelope

Section 4.0 Building Envelope

4.1 Introduction

Building envelope maintenance involves servicing the exterior walls of the building (including windows, doors), foundations, parking garages and roofs.

4.1.1 Window Cleaning Safety

Description: Authorities in accident prevention recommend that no one under 18 or over 50 years of age be permitted to do window cleaning at heights. Proper ladders or scaffolds are essential, and using stacked boxes or other unstable supports should never be used to access windows.

Action

1. Outside window work should not be done when weather conditions, such as snow, ice, or high winds create a safety hazard.

2. Smoking should not be allowed.

3. Acid solutions should not be used, as they may be hazardous to the individual and to surrounding building materials, trees, landscaping and property.

4. While any action that might break the glass should be avoided, in the event of breakage, all broken pieces on ledges and the area below the window should be immediately and carefully collected and packaged for the garbage. This particularly applies to splinters of glass that may be hidden in grass or dirt.

Several provinces have regulations outlining the legal requirements for window cleaning. Contact the appropriate provincial ministry for further information.

4.2 Foundations

The foundation of the building must be properly maintained to prevent water infiltration and to preserve the structural integrity of the building. The foundation may include a basement, slab on grade, crawl space or parking garage.

4.2.1 Hairline Cracks in the Foundation Wall

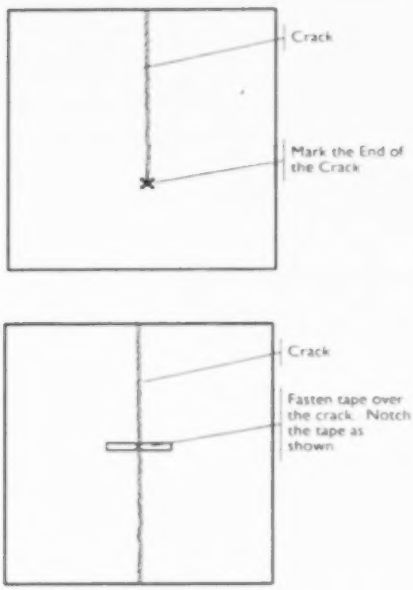
Description: Small hairline cracks are not usually serious and can often be repaired. These are likely caused by curing or drying out of the foundation within the first year of construction. It is necessary to determine if the crack is active or dormant.

Action

1. To determine if the crack is lengthening, mark the ends. (See ***Figure 4.1***) After one week, return to see if the crack has progressed beyond the original mark. If it has, the crack is active. If the crack has not lengthened, remember to check it periodically during the ***Look/Touch/Listen*** (LTL) inspections.

2. To determine if the crack width is changing, or if the crack is shifting, fasten tape over the crack. (See ***Figure 4.1***) After one month, return to inspect the tape. If the tape has torn (increased width or shifted), or has become wrinkled (decreased width), the crack is active.

Figure 4.1 Concrete Foundation Crack Movement Detection



3. If the crack is active, professional assistance is necessary. Fill out a ***Maintenance Request Form*** and forward it to the property manager.

4. If the crack is dormant and not exposed to water or abrasive conditions, it can be repaired with an appropriate sealant. Fill out a ***Maintenance Request Form*** and forward it to the property manager.

5. If the crack is exposed to water or abrasive conditions, a protective coating may be required. Fill out a ***Maintenance Request Form*** and forward it to the property manager.

6. Inspect the cracked area regularly during the LTL inspections to determine if further damage occurs.

4.2.2 Concrete Floor Slab Cracks

Description: Hairline cracks in concrete floors are common. Such surfaces include balconies, underground parking slabs, ramps and sidewalks. As long as they are not exposed to excessive wear, road salts or water, these cracks should not cause future problems. In the event of exposure, repair strategies may be required. Larger cracks (greater than 1.6 mm) in concrete floors can be caused by uneven building settlement or improper expansion joint design or construction. Early detection and repair can save significant time, money and disruption in the future.

Action

1. Large structural cracks should be analyzed by a structural engineer. If found, fill out a ***Maintenance Request Form*** and forward it to the property manager.

2. Monitor and document small hairline cracks that are not exposed to a harsh environment in order to compare their movement over time.

3. Seek professional assistance in order to specify a suitable remedial measure.

4. Cracks in concrete floors that experience harsh environments.(such as balconies, underground parking slabs and ramps, and sidewalks) must be repaired as soon as possible.

4.2.3 Concrete Suspended Slab Cracks

Description: Cracks in suspended slabs (such as parking garage floors, canopies, etc.) have the potential of being very dangerous, and must be addressed immediately. Early detection and repair can save significant time and money.

Troubleshooting

1. Floor slab cracks are usually detected by visual inspection from below. Look for signs of water leakage and efflorescence. If found, fill out a ***Maintenance Request Form*** and forward it to the property manager.

4.2.4 Concrete Floor Slab Sinking

Description: Sinking of non-load bearing concrete slabs is usually due to soil compacting beneath the slab. The problem is indicated by a widening space between the wall baseboard and the floor or cracks and a sloping of the floor slab itself.

Action

1. If widening of the wall-floor joint is noted, fill out a ***Maintenance Request Form*** and forward it to the property manager.

4.2.5 Water Leakage Into Basement

Description: A primary source of water leakage in basements is poor water drainage from pitched roofs or flat roof scuppers being directed to the perimeter footing drain. Water leakage problems can also occur if rain or melting snow is allowed to pool next to the foundation. In some cases, water leakage may actually be condensation—moisture in the indoor air that condenses on the relatively cooler interior walls and floors of the foundation. Solving water leakage problems usually starts with preventing water from getting to the foundation. Solutions such as coating the inside basement walls are generally not effective.

Action

1. If water is leaking into the basement during, or immediately after, a rainfall, check that the floor drains are not clogged and that surface drainage slopes away from the building foundation.

2. If the source of water is from roof drainage, direct the drainage pipes away from the building.

3. If the source of water is from condensation, it is necessary to get air movement in the area where the condensation is occurring. Do this by installing and running exhaust fans. If there is still a condensation problem, install dehumidifiers in the area. The source of the moisture in the air should be dealt with as well. There should be no puddles left on the floor, leaking mechanical systems should be fixed, clothes dryers should be properly vented outside. Fill out a ***Maintenance Request Form*** and forward it to the property manager if the problem is still not solved.

4. If the source of leakage is not obvious or not easily fixed, fill out a ***Maintenance Request Form*** and forward it to the property manager.

4.3 Above Grade Structures

Above grade structural problems include wall-siding problems, uneven floors, cracks, plaster damage, drafts and water leakage.

4.3.1 Uneven Floors

Description: Improper curing or varying loads on the concrete slabs can create unevenness and gaps in finished floors.

Action

1. From the interior, repair any separation that is less than 6.4 mm by filling the space with a paintable acrylic latex caulking.

2. If the separation is more than 6.4 mm it should be filled with a polyethylene backer-rod before using a paintable acrylic latex caulking.

4.3.2 Cracks in Above Grade Walls

Description: Most cracks occur early in the life of a building and are usually a result of foundation settlement. Most of the time these cracks are superficial and easily repaired. These cracks should be inspected periodically and repaired as necessary. A building envelope specialist should investigate re-occurring cracks. Cracking and buckling of stucco or brick veneer finished wall systems can indicate that the support for the wall has failed—a condition requiring the help of a building envelope specialist.

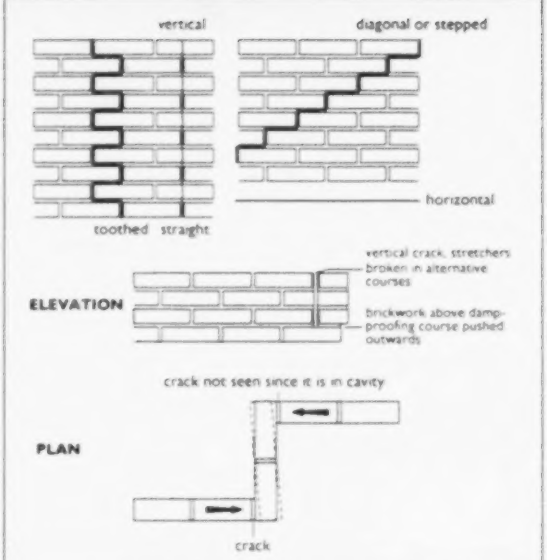
Action

1. Fill out a ***Maintenance Request Form*** containing the following information:
   a) description—use ***Figure 4.2*** and ***Figure 4.3*** to describe the crack.
   b) extent—where does it start and where does it finish?
   c) width—does the width vary or is it the same all the way along?
   d) depth—using a piece of fine wire or a ruler, measure the depth of the crack in at least two or three places.
   e) alignment—run your finger down the crack and see if the two side are evenly matched.
   f) sharpness of edges—sharp edge suggests a recent crack whereas a smooth edge likely means that it has gone undetected for some time.

2. Outside cracks should be repaired promptly as rain water leakage will cause rapid deterioration.

3. Settlement cracks should be repaired by a mason. Forward the completed ***Maintenance Request Form*** to the property manager.

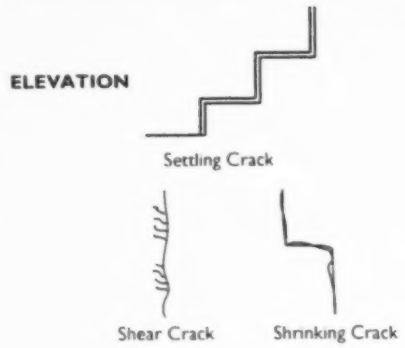
Figure 4.2 Crack Types in Brick and Block Walls



4.3.3 Plaster Deterioration

Description: The failure of interior drywall or plaster surfaces is usually caused by the presence of water, moisture or vapor. Water can come from wall or roof leakage, or leading plumbing, bath and shower fixtures. All wet deteriorated plaster and drywall must be replaced as it cannot be adequately dried. Wet plaster and drywall can encourage mold growth that will cause further damage and potentially adversely affect the health of the occupants. The moisture or leakage source must be located and repaired prior to the installation of new drywall or plaster.

Figure 4.3 Crack Types in Concrete Walls



Action

1. Locate and repair the source of the water that has caused the damage (for example, leaking roof, water penetration of walls or windows, condensation in the attics or on the walls). Add bathroom fans to deal with bath-and shower-related moisture; ensure bath-shower enclosures are well sealed, have sound grout, and are properly drained.

2. Remove deteriorated plaster-drywall from any affected areas.

3. Re-plaster or re-drywall using professional re-plastering kits available at hardware stores.

4. Smooth over with fine sandpaper and if necessary, repaint the surface to match its surroundings.

5. If the plaster or gypsum deterioration continues and is not an isolated problem, contact the building manager and get professional help.

4.3.4 Plaster-Drywall Cracks

Description: Cracks in plaster, drywall and gypsum, are generally due to movement within the wall system. Most cracks appear where different materials used during construction meet. If a crack appears at a joint of a gypsum drywall, it usually indicates too much moisture or improper taping of the boards.

Action

1. Check the crack for movement. If the crack moves in different directions because of the seasonal temperatures, then the crack should not be filled in. Installing an expansion joint at the bottom of the crack should help fix the problem.

2. If the crack is not shifting at different temperatures, then solid, not elastic, fillers should be used to seal the crack permanently.

3. Cracks that run diagonally from windows and doorways usually indicate movement or settlement of the wall. Check to ensure that the walls are adequately supported.

4. Cracks that occur at the wall ceiling joint in wood-frame buildings can be the result of roof truss uplift. It is often not practical to repair these joints as they are caused by the seasonal expansion and contraction of the roof trusses. Moldings can be used to hide the corner joint. Such moldings should only be fastened to the ceiling so that they can "float" with the movement of the trusses but still hide the crack.

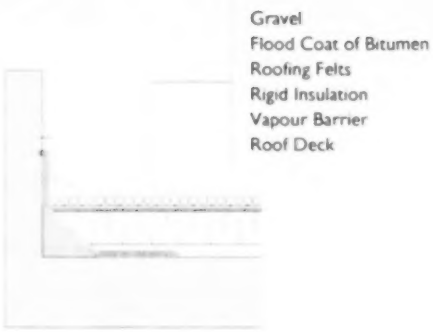
4.4 Flat Roof Systems

Two common types of flat roof systems that are used in multi-residential buildings are the Built-Up Roof (BUR) and the flat Inverted Roof.

4.4.1 Built-Up Roof

The Built-Up Roof (BUR) is the most common roof system. The primary maintenance concern is the integrity of the bitumen (commonly called "tar") coat covering the roofing felts.

Figure 4.4 Section Through Built-Up Roof



Problems that may occur with the bitumen coat are as follows:

Problem 1: Exposed Bitumen

Description: Roofing gravel is used to protect bitumen from deterioration by the sun's ultraviolet rays. It also protects the bitumen when people walk on the roof. Where the gravel has thinned, (usually in corners or ridges), repairs, preferably by a qualified roofing contractor, are sometimes required.

Action

1. If a bare spot is found, it is repaired by pouring hot or cold bitumen on it, and following the instructions on the bitumen container (purchased from a building materials supplier).

2. New gravel is spread over the bitumen once hardened somewhat. The time needed to harden depends on the season, outside temperature and amount of bitumen poured.

3. If it looks like there are many areas of the roof that need repair, then re-roofing may be the only solution. Fill out a ***Maintenance Request Form*** and forward it to the property manager.

Problem 2: Blisters

Description: Blisters are bubbles that can occur in the bitumen. They are rare during the cold season and usually only occur when it is hot. They are caused by moisture and air that has escaped from the roof or the building becoming trapped under the bitumen layer. If the blisters are not fixed immediately, they will continue to grow until they break the roofing membrane allowing water into the building.

Action

1. Wherever possible, find the source of moisture and take action to repair. This may require the services of a building envelope or roofing consultant as in many cases the source of water or moisture is not clear.

2. Fill out a ***Maintenance Request Form*** to have the blister fixed, and forward the form to the property manager.

Problem 3: Splits

Description: Splits occur primarily at joints in the roof deck insulation and will tend to run parallel to the roofing felts. A sudden drop in outdoor temperature, faulty construction, poor building materials, and movement of the pre-cast roof slabs can all cause splits in the roofing membrane. Splits allow water to enter the roof system. Immediate action should be taken to repair the splits before additional damage occurs.

Action

1. Fill out a ***Maintenance Request Form*** to have the split in the membrane fixed, and forward the form to the property manager.

Problem 4: Alligatoring

Description: "Alligatoring" occurs when the bitumen coating "wrinkles." Wrinkling is the result of ultraviolet deterioration of the top coating of bitumen. This happens to areas of bitumen that have been left bare of gravel and exposed to the sun for too long. Alligatoring is the first sign of future problems. Once alligatoring occurs, water penetration and splitting may follow.

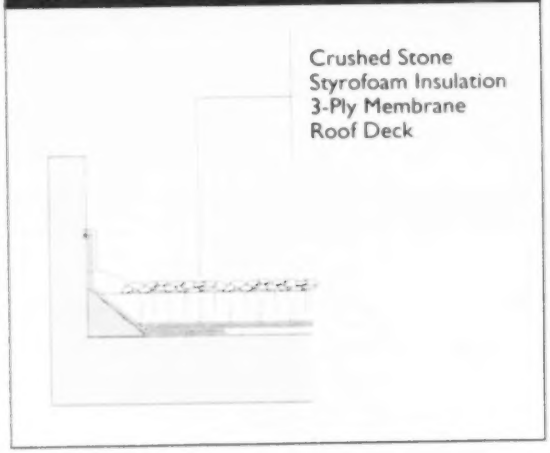
Action

1. Small areas may be repaired by re-saturating the affected area with bitumen or other commercial roof repair products. Gravel is then installed over the repair. For larger areas, the affected roofing layers are removed and reapplied. This type of work should be carried out by a qualified roofing contractor. Fill out a ***Maintenance Request Form*** to have the alligatoring in the membrane fixed, and forward the form to the property manager.

4.4.2 Inverted Roof

Description: The Inverted Roof is a newer roof system. It is unique in that the insulation is located above the roof waterproofing membrane. This type of roof requires very little maintenance, as the membrane is well protected by the insulation and a layer of ballast that holds the insulation down. The primary maintenance concern is to maintain the integrity of the bitumen coat on the roofing felts or the membrane—depending on the system used.

Figure 4.5 Section Through Inverted Roof



Little maintenance is required for this roof type; however, roof checks should be performed periodically. Ballast can be shifted by the wind or rooftop traffic by trades people leaving the insulation and membrane unprotected.

Action

1. If there is a problem with the roof, fill out a ***Maintenance Request Form*** and forward the form to the property manager.

4.4.3 Ponding

Description: Ponding is the accumulation of water on a flat roof. Ponding is primarily a result of improper roof slope. With poorly sloped roofs, water cannot flow to roof drains or scuppers. Sometimes ponding occurs due to ice buildup around drains and scuppers. Improper roof drainage can be caused by a clogged roof drain, improperly located drains, incorrect roof slopes and/or roofs that have warped due to building settlement or excessive loading. Ponding water retards the self-sealing properties of the bitumen.

Action

1. Regularly inspect the roof for areas with accumulated water.

2. Check for clogged drains and scuppers and clean them as necessary.

3. If the drains are not at the low spots in the roof system, additional roof drains may have to be installed. Alternatively, the roof may have to be repaired to obtain the correct drainage flow. Fill out a ***Maintenance Request Form*** to have the ponding fixed, and forward the form to the property manager.

4.4.4 Leaks at Flashings

Description: Flashings are located where two or more different materials meet. They are used to cap parapets, protect valleys in roofing assemblies, and provide drainage away from window lintels and sills. Flashing can be made from rubberized membranes, or metal. The different expansion rates of the flashing materials and those materials that they are attached to can cause sealants to crack and break which in turn allows water to enter the membrane of the roof.

Action

1. Flashings must be checked regularly to see if they show signs of deterioration or separation. They should be refastened as required.

2. Caulk all nails, fasteners and joints of the flashing. The caulking has to be compatible with the different overlapping materials and must be able to withstand both expansion and contraction.

4.4.5 Leaks at Expansion Joints

Description: Expansion joints in roofs are installed to limit the amount of movement in the roof assembly. The most commonly found materials in expansion joints are metal, plastic, and/or rubber. All these materials, (especially plastic and rubber), tend to deteriorate with constant exposure to Canada's harsh environment. If the materials are not replaced or fixed, then the deterioration is likely to lead to cracks and leaks.

Action

1. Check rooftop expansion joints for cracks and signs of deterioration at least four times per year.

2. Have cracks and deteriorated expansion joint materials repaired as soon as detected.

3. In the replacement process, it is best to upgrade, whenever possible, to more durable, modern and compatible materials.

4.4.6 Leaks at Pitch Pans

Description: Pitch pans are used to seal the junction of roofing membranes at roof projection points. These roof projections include such items as flagpoles, television towers, stacks, rooftop HVAC units and mechanical/electrical equipment conduits. Pitch pans are often filled with a compound to work as a sealer. These compounds dry and crack, and allow water to enter.

Action

1. The compound in the pitch pockets should be replaced and re-poured when cracking is noticed. Keep pockets slightly overfilled at all times.

4.4.7 Damage due to Traffic

Description: Sleepers, wooden or otherwise, placed directly on top of a graveled roof as supports for walkways, can place stress on the roof systems. During hot spells, the sleepers may force the gravel deep into the bitumen and may even puncture the roof membrane. If punctures occur, water could leak through the holes into the roofing felt. Once water penetrates the felt, it is very difficult to extract it without rebuilding the affected area of the roof.

Action

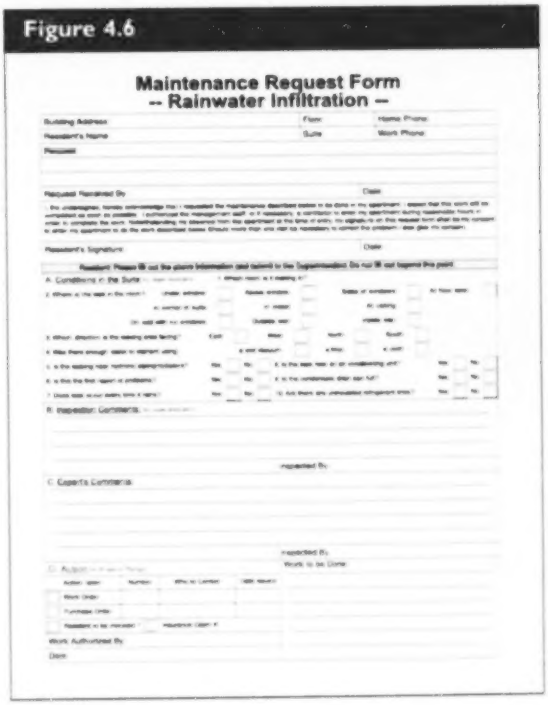
1. During the hot season, inspect under the sleepers for punctures and recessed gravel.
2. If moisture is found under the sleepers, remove them and repair the roof damage.

4.5 Rainwater Infiltration

Description: Rainwater infiltration can damage the exterior finish of the building, interior materials, furniture, fixtures, etc. Rainwater penetration is often responsible for mold growth within apartments. Problems normally develop around doors, windows, roofs, mechanical and electrical service penetrations, balconies and structural joints. Sometimes wind-driven rain can penetrate straight through the walls. Rainwater infiltration must be corrected immediately or else larger, more costly and disruptive problems will occur.

Figure 4.6 illustrates a sample ***Maintenance Request Form – Rainwater Infiltration***. A blank copy of this form is located at the end of this chapter.

Figure 4.6



Maintenance Request Form
-- Rainwater Infiltration --

*A. **Conditions in the Suite***
Filled out by the Superintendent during the initial suite inspection.

*B. **Inspection Comments***
Filled out by the Superintendent during the initial suite inspection.

*C. **Expert's Comments***
To be filled out by a service specialist in the particular field.

*D. **Property Manager***
To be filled out by the property manager to authorize any repair work.

Action

1. When a tenant first complains about a water infiltration problem, fill out the top section of the ***Maintenance Request Form***, and have the tenant sign and date it. Get as much information about the problem as possible. Information such as *"When did the problem start?" "Does it only happen when it rains, or does it also happen during high-humidity periods?", "Is there a cold water pipe nearby?", " Is there a lot of wind when this happens?", "What do you think the source of the problem is?"* etc. will help to diagnose the problem.

2. Visit the suite as soon as possible to personally diagnose the problem. This step is critical in minimizing the total cost of the problem. The inspection should result in one of three decisions:
   i) Fix the problem immediately.
   ii) Order the parts required to fix the problem.
   iii) Have the problem looked at by an outside service specialist in the particular field.

   Write down everything that is noticed about the problem in section B of the form.

3. A contractor is not needed if onsite staff can fix the problem easily with available tools. Write down the action taken in **section B** of the form. If the problem cannot be fixed by onsite staff, submit the form to the property manager as soon as possible.

4. Wet drywall or plaster must be removed and discarded. Wet carpets should be dried as soon as possible. Personal belongings that have become wet may have to be discarded also if they become moldy. Repairs should only be done when the rainwater infiltration problem has been resolved.

Further Reading

Canada Mortgage and Housing Corporation, Cost-Effective Concrete Repair: Research, Investigation, Analysis and Implementation, *Canada Mortgage and Housing Corporation*

Industrial Accident Prevention Association, Shredder-Compactor Safety, *Industrial Accident Prevention Association*

Liska, Roger W., PE, Means Facilities Maintenance Standards, *R.S.Means Company Inc.*

Ontario Government - Ministry of Housing, Deterioration of Parking Structures, *Queen's Printer for Ontario*

Ontario Government - Ministry of Housing, Planned Maintenance Manual, *Queen's Printer for Ontario*

Ontario Government, A Guide to the Occupational Health and Safety Act, *Queen's Printer for Ontario*

Resident Managers' Training Institute, Apartment & Condominium Operators' Manual, *Resident Managers' Training Institute*

Shear, Mel A., Handbook of Building Maintenance Management, *Prentice-Hall Inc.*

Shear, Mel A., Property Management Reinvented; How to Convert Maintenance and Energy Expenses to Profits, *Prentice-Hall Inc.*

BLANK FORMS

Maintenance Request Form
-- Rainwater Infiltration --

Building Address:	Floor:	Home Phone:
Resident's Name:	Suite:	Work Phone:
Request:		
Request Received By:		Date:

I, the undersigned, hereby acknowledge that I requested the maintenance described below to be done in my apartment. I expect that this work will be completed as soon as possible. I authorized the management staff, or if necessary, a contractor to enter my apartment during reasonable hours in order to complete the work. Notwithstanding my absence from the apartment at the time of entry, my signature on this request form shall be my consent to enter my apartment to do the work described below. Should more than one visit be necessary to correct the problem I also give my consent.

Resident's Signature:	Date:

Resident: Please fill out the above information and submit to the Superintendent. Do not fill out beyond this point.

A. Conditions in the Suite (by Superintendent)

1. Which room is it leaking in?

2. Where is the leak in the room? Under window ☐ Above window ☐ Sides of windows ☐ At floor level ☐
In corner of suite ☐ In closet ☐ At ceiling ☐
On wall with no windows ☐ Outside wall ☐ Inside wall ☐

3. Which direction is the leaking area facing? East ☐ West ☐ North ☐ South ☐

4. Was there enough water to warrant using a wet Vacuum ☐ a Mop ☐ a cloth ☐

5. Is the leaking near hydronic piping/radiators? Yes ☐ No ☐

6. Is this the first report of problems? Yes ☐ No ☐

7. Does leak occur every time it rains? Yes ☐ No ☐

8. Is the leak near an air conditioning unit? Yes ☐ No ☐

9. Is the condensate drain pan full? Yes ☐ No ☐

10. Are there any uninsulated refrigerant lines? Yes ☐ No ☐

B. Inspection Comments: (by Superintendent)

Inspected By:

C. Expert's Comments:

Inspected By:

D. Action (by Property Manager)

Action Taken	Number	Who to Correct	Date Issued
☐ Work Order			
☐ Purchase Order			
☐ Resident to be Invoiced ? ☐ Insurance Claim #:			

Work Authorized By:

Date:

Work to be Done:

Maintenance Request Form
-- General --

Building Address:	Floor:	Home Phone:
Resident's Name:	Suite:	Work Phone:
Request:		
Request Received By:		Date:

I, the undersigned, hereby acknowledge that I requested the maintenance described below to be done in my apartment. I expect that this work will be completed as soon as possible. I authorized the management staff, or if necessary, a contractor to enter my apartment during reasonable hours in order to complete the work. Notwithstanding my absence from the apartment at the time of entry, my signature on this request form shall be my consent to enter my apartment to do the work described below. Should more than one visit be necessary to correct the problem I also give my consent.

Resident's Signature:	Date:

Resident: Please fill out the above information and submit to the Superintendent. Do not fill out beyond this point.

A. Conditions in the Suite

Inspected By:	Date:

B. Action Taken to Fix Problem

Problem Corrected By:	Date:

C. Recommended Action Required

Recommended By:	Date:

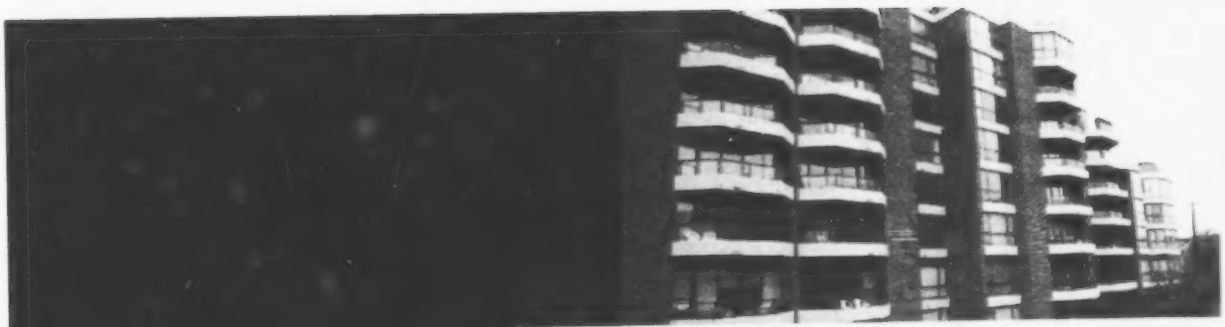
D. Property Manager

Action Taken	Number	Who to Correct	Date Issued
☐ Work Order			
☐ Purchase Order			
☐ Resident to be Invoiced ?	☐ Insurance Claim #		

Work Authorized By:

Date:

Work to be Done:



SECTION 5.0

electrial, lighting, motors and appliances

Section 5.0 Electrical, Lighting, Motors and Appliances

5.1 Introduction

This section covers troubleshooting lighting systems, replacing fuses, resetting circuit breakers, checking emergency power systems, and dealing with malfunctioning electrical appliances.

5.1.1 Power Wiring

Description: Working on the electrical systems in a building is potentially very dangerous, and should only be undertaken by qualified personnel. The following safety rules should be followed:

Action

1. Use proper insulated tools and a wooden or electrically insulated ladder.

2. Never assume that the power is off. Always check the circuit first with an electrical meter to ensure that the circuit is no longer live. Treat all electrical conductors as alive until proven to be dead.

3. Treat insulated conductors the same as bare conductors since the insulation may be faulty.

4. Some equipment may have two separate sources of power. Make certain that all power sources are turned off before performing work on the equipment.

5. Building staff should not perform work on any equipment or panels that are over 240V. Other electrical work may be governed by provincial or municipal standards and may require a permit, an inspection and the services of an electrician. Check with local building code authorities before beginning any work.

6. Use only electrical cords that are in good condition. Cords with frayed or cracked insulation should be destroyed. Roll up and store cords carefully, keeping them dry and free of kinks and twists.

7. Use polarized plugs and properly installed grounded wiring.

8. Portable power tools should be equipped with three wire cords and only be attached to properly grounded outlets by a three-pronged plug.

9. All permanently installed appliances should be properly grounded. This is especially important in the case of washing machines, dryers, electric ironing machines and other equipment that may be used in potentially damp laundry rooms.

10. The installation, use and maintenance of any electric wiring or equipment, whether fixed or portable, must comply with the provisions of local ordinances. Overheating of such equipment and short circuits in improperly installed or maintained equipment are two major causes of fires. Building insurance may be void if electrical work is not done properly.

11. "Octopus plugs" (too many extension cords plugged into an electrical outlet) should not be used as they frequently overload the power supply to wall outlets.

12. Look for electrical equipment that does not work properly, is running hot or smells unusual. Strange odours from appliances or lights may be the first sign of fire or appliance failure.

13. Keep heat-producing devices (electric baseboard heaters) away from flammable materials (curtains, upholstery etc.).

14. Do not use extension cords to supply fixed or permanent equipment. Appliances should be either permanently connected or plugged directly into convenience receptacles.

15. Do not replace blown fuses with fuses of a higher rating or use any other means to restore power. Should the fuse continue to blow, call an electrician.

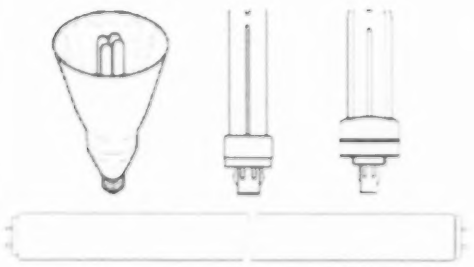
5.2 Lighting Systems

There are two main types of lighting in residential buildings: fluorescent and incandescent. Other types of lighting include compact fluorescent, halogen, metal halide, mercury vapour and high-pressure sodium.

5.2.1 Fluorescent Lamps

Description: Fluorescent lighting is the most common lighting in offices and common areas in multi-unit residential buildings. There are three main types: Rapid start, instant start, and preheat lamps. Preheat lamps make use of a "starter" which warms the electrodes before lighting the tube. The other lamp types do not.

Figure 5.1 Compact Fluorescent with Reflector, Ballast and Screw in Base.



F40T12 Flourescent Lamp

Fluorescent lamps and tubes require ballasts to provide sufficient voltage for start-up and then to limit the current during operation. Each type of ballast is intended for only one type of tube. ***Make certain the correct ballast is used for a specific tube type.*** When replacing tubes, replace all the ones in the fixture.

There are a number of problems that can occur with fluorescent lamps. The following is a list of common problems and their respective solutions:

Tube Will Not Light

Description: A lamp not lighting can be caused by a defective tube, a defective ballast or a wiring/connection problem.

Troubleshooting

1. Check the electrical panel for blown fuses and open circuit breakers. Replace burned out fuses and reset open breakers. If the fuse blows again or the breaker trips again, call an electrician.

2. Check that the pins on the tube make contact with the holders. For starter and rapid start tubes, rotate the tube. For instant start, make certain pins are firmly seated. New holders can be installed if necessary.

3. If the tube will still not light, replace the tube.

4. If the tube will still not light, replace the ballast. See ***Ballast Replacement*** below.

5. If the tube will still not light, there is a wiring problem. Disconnect the power by tripping the breaker or removing the fuse and call an electrician.

Other Problems

Description: Other problems that may occur with fluorescent fixtures are tube flicker, fixture noise, light level reduction and discolouring of tube ends.

Troubleshooting

1. ***Tube Flicker:*** Check that the tube is properly and firmly seated in the tube holders. Flicker in new tubes is common, and should improve. If it does not improve, or the tube is old, replace the tube.

2. ***Fixture Noise:*** Fixture noise or "hum" is a result of a bad or improperly selected ballast. Replace the ballast with an electronic ballast or a standard ballast with a sound rating of "A". (See ***Ballast Replacement*** below.)

3. ***Light Level Reductions:*** Light level reductions are usually caused by dust accumulation on the tubes, lenses and reflectors. Remove the tubes and clean them. While the tubes are out, clean the fixture and the fixture lens, then replace the tubes. There will be a slight decrease in light levels over the life of the tube. If the light levels are still low after cleaning the fixture and tubes, replace the tubes.

4. ***Brown or Grayish Ends:*** Discolouring of the tube ends is common over the life of the tube. Brown or grayish bands about 5 cm from the ends of the tubes are normal. Replace the tube only if the light levels are too low.

Ballast Replacement

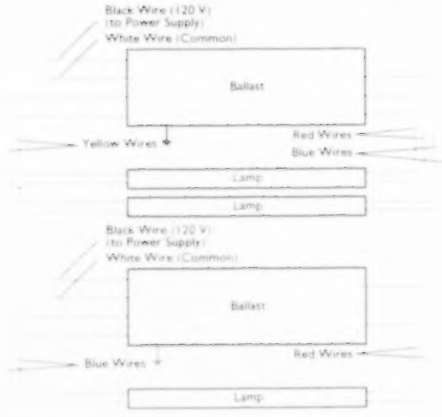
Description: Standard ballasts (coil-core) are inexpensive, but also very inefficient. They operate at a line frequency of 60 Hz and produce an audible "hum" that can be very noisy. The loudness of the "hum" depends on the sound rating and the age of the ballast. Avoid installing a standard ballast whenever possible. Electronic ballasts are very efficient and reasonably priced. They operate by increasing the frequency beyond the audible range, and are therefore inherently quiet. Electronic ballasts should be used to replace standard ballasts whenever possible.

Action

1. If the fixture is over 130V, or none of the maintenance staff are properly trained to replace the ballast, call an electrician. The lamp voltage is indicated on the breaker panel that supplies power to the ballast.

2 Replace the ballast with a ballast rated for the same type and number of lamps. The new ballast should have the same or better sound rating than the one being replaced. Use the wiring diagram on the ballast to ensure proper hook-up. **Wiring diagrams may vary between ballasts, so it is important to replace ballasts with the same type.**

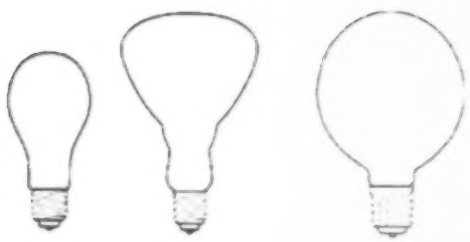
Figure 5.2 Typical wiring diagrams for 1-lamp and 2-lamp ballasts.



5.2.2 Incandescent Lamps

Description: There are several different screw base sizes available for incandescent lighting. The most common is the 25 mm medium screw base. The larger the screw base, the larger the maximum wattage used. Voltage should also be taken into account, as there are four separate voltage ratings normally available: 115, 120, 125, and 130 volts. Incandescent lamps are designed to give the maximum lighting efficiency at a specific voltage on a given circuit. Common problems and solution are listed below.

Figure 5.3 Incandescent Lamps (Bulbs)



Lamp Will Not Turn On

Description: Incandescent lamps typically have a much shorter life than fluorescent tubes (1,000 hrs. vs. 20,000 hrs.) requiring frequent replacement.

Troubleshooting

1. Tighten the lamp in the socket.
2. Replace the lamp if it is burned out.
3. Check the fuse box for blown fuses or open circuit breakers. Replace fuses or reset circuit breakers as required.
4. If the lamp will still not turn on, turn off the power at the breaker panel and check the light switch and the fixture for damage or loose wiring. Tighten wiring and connections as required and replace damaged items.
5. If the lamp will still not turn on, there is a wiring problem in the circuit. Turn off the power at the circuit breaker or fuse box, and call an electrician.

Lamp Burns Dim

Description: A dim burning lamp can be caused by an improper lamp selection or by dirt accumulation on the bulb or lense.

Troubleshooting

1. The voltage may be too low. Verify the lamp rating matches the line voltage.
2. Remove and clean the lamp and lenses.
3. If the lamp is still too dim, replace the lamp with a higher wattage lamp. **Do not exceed the wattage rating of the fixture as a fire may occur.**

Short Lamp Life

Description: Frequent replacement of problem lamps can be very time consuming. The underlying problem should be found and remedied.

Troubleshooting

1. The voltage may be too high. Ensure the lamp rating matches the line voltage.
2. If the lamp is subject to vibrations or mechanical shock, use vibration or rough service bulbs.

3. If the bulb is in a hard-to-service area, install longer life lamps. These lamps are more expensive and less efficient, and therefore should not be used in normal applications.

4. The lamp type may be incorrect for the particular receptacle. Ensure that the maximum wattage is not exceeded.

5. The voltage supply to the building may fluctuate or have spikes (common in rural areas). In this case, install lamps specially designed for fluctuating voltages.

Lamp Breakage

Description: Lamp breakage is potentially dangerous, as live wires may be exposed. A broken bulb that is still in its socket can be difficult to remove—always switch the power to the fixture off at the breaker when attempting to repair. Also, the glass can splinter and be difficult to clean up.

Action

1. Bulbs coming in contact with the fixture or fixture lense can break. If the bulb touches the light fixture, change the bulb to the proper bulb size.

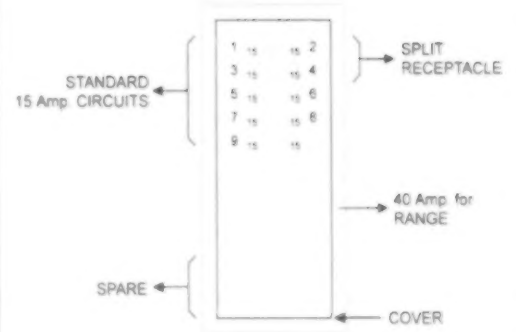
2. Any contact of the bulb with water will cause it to break. Use an enclosed, watertight luminaire if the lamp may become exposed to water.

3. Poor quality lamps often break at the base. In this case, use a higher quality lamp.

5.3 Fuses, Circuit Breakers and Switches

A typical fuse panel (see ***Figure 5.4***) consists of screw-in type fuses, a pullout block and a space for spare fuses. The screw-in fuses typically supply lights (15 Amp.), receptacles (15 Amp.) and the refrigerator (20 Amp.). The pullout block contains two 20-Amp fuses and supplies the stove (range).

Figure 5.4 The fuse panel of a typical apartment or house.



5.3.1 Replacing Fuses

Description: Fuses protect the wiring system and electrical equipment from short circuits or overloads. A fuse will "blow" as a result of too high a current passing through the circuit. A failed fuse can be identified by the strip of metal in the fuse being "cut" or dissected or the glass face of the fuse may be blackened. **Do not stand in a damp spot when working on a fuse panel, and make sure your hands are dry.**

Action

1. A blown fuse must be replaced. **Always replace a blown fuse with a new fuse of the same ampere rating.** Putting a new fuse of a higher rating is very dangerous and may result in an overload of fire. **Never insert pennies or tinfoil into the fuse socket. This practice is not only illegal, but very dangerous and potentially life threatening.**

2. Before replacing a fuse, turn off all lights and disconnect all devices on the circuit controlled by that fuse. The inrush current that occurs when lights and appliances are turned on may blow the new fuse as it is installed.

3. To change a ferrule-type or knife-blade cartridge fuse, remove the appropriate block. For any other fuse, touch only the insulated outer rim to unscrew it.

4. Inspect the surrounding insulators for breaks, cracks or burns. Before installing a new fuse check the fuse holder for corrosion on the inside of the fuse tube.

5.3.2 Resetting Circuit Breakers

Description: A circuit breaker performs the same function as a fuse, but it can be reset if it has been opened due to an overload. As with fuses, it is recommended that all lights and appliances on the circuit protected by the breaker be turned off before the breaker is reactivated.

Troubleshooting

1. Push the circuit breaker handle to the extreme "OFF" position.

2. Return the handle to the "ON" position.

3. If the circuit does not reactivate, the breaker may need replacing.

4. After every fault interruption, inspect the breaker for any unusual conditions such as noises, temperature change, smoke, oil/air leakage or friction. The breaker should be warm to the touch, but not hot.

5. A breaker that keeps tripping usually indicates a problem with the circuit or the loads being plugged into the circuit. Be aware of octopus plugs for entertainment appliances and check to ensure plugs are not overloaded by appliances. If the breaker continues to trip, call an electrical to investigate the problem.

5.4 Wall Receptacles

5.4.1 Testing

Description: All suite receptacles should be checked for proper wiring before a new tenant moves in. This can be performed with a three-prong circuit tester, available at any local hardware store.

Troubleshooting

1. Check each outlet following the circuit tester instructions.

2. If an outlet fails the test, turn off all power to the outlet, meter the outlet to ensure the power is off, and check the wiring. See ***Outlet Replacement*** *below for correct wiring procedures.*

3. If the wiring is wrong, fix it. An electrician may be required to do this work. If the wiring appears correct, call an electrician.

5.4.2 Replacing

Description: Proper training and a working knowledge of residential wiring are required to replace a wall receptacle. If you are unsure about how to replace a receptacle, have an electrician show you how to do it. Receptacles should be replaced if they are not functioning properly. They are also replaced to "update" the look of an apartment. All bathroom and kitchen receptacles in the vicinity of sinks should be placed with ground fault indicator (GFI) receptacles to prevent electric shock.

Troubleshooting

1. Turn off all power to the receptacle at the breaker panel (or fuse box). In certain instances, (typically in the kitchen) there may be two breakers (or fuses) per receptacle.

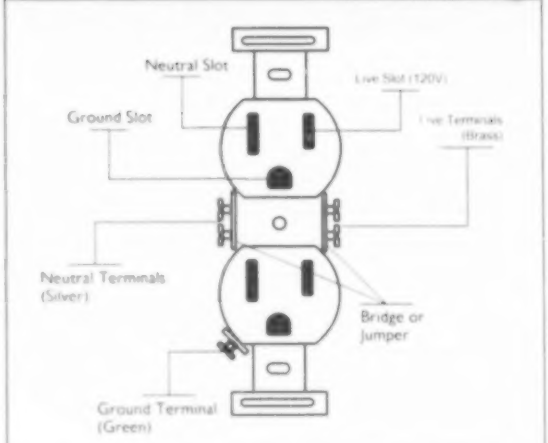
2. Use a meter to ensure that the power is off at the receptacle to be replaced.

3. Remove the receptacle from the wall.

4. Remove the wires from the receptacle. Take note as to how many sets of wires go to the terminal, the location of the connections and the colour of the wires. Check the existing receptacle for broken or missing bridges. If the bridges are broken or missing, the two plugs on the receptacle are on different circuits.

5. If the two plugs are <u>not</u> on the same circuit, **remove the bridge between the neutral terminals and the bridge between the live terminals.** With the one set of wires, connect the neutral (white) wire to the top *neutral terminal*, connect the live (black) wire to the top *live terminal*, and connect the ground (green or bare copper wire) to the *ground terminal*. Connect the second set of wires in the same manner, to the bottom terminals.

Figure 5.5 Wall Receptacle



6. If the two plugs are on the same circuit, connect the neutral (white) wire to one of the *neutral terminals*, connect the live (black) wire to one of the *live terminals*, and connect the ground (green or bare copper wire) to the *ground terminal*. Leave the two bridges intact.

7. When connecting wires to the terminals, the wire should be wrapped around the terminal screw in a clockwise direction. (This causes the wire loop to tighten when the terminal screw is tightened.) The amount of bare wire should be limited to one loop of the terminal screw.

8. Double-check the wiring. Test the strength of each connection to ensure the wires will not disconnect when the receptacle is replaced in the wall. Replace the receptacle in the wall.

9. Turn on the power to the outlet at the breaker panel.

10. Test the wall outlets with a receptacle circuit tester. If one of the outlets fails, turn off the power at the breaker panel, fill out a ***Maintenance Request Form*** and forward it to the property manager.

5.4.3 Aluminum Wiring

Description: Aluminum wire has a tendency to expand and contract under electrical load, causing connections at the receptacles, wall switches and hard wired light fixtures to loosen over time. The aluminum can also oxidize resulting in further deterioration. The loose connections can overheat and start a fire. This is only a problem in buildings where the branch wiring is aluminum and special connectors were not used.

Troubleshooting

1. Select a minimum of 10 suites or 10 per cent of the suites (whichever is greater) to be checked for faulty wiring.

2. Check the tightness of the connections on all of the wall switches, receptacles and light fixtures. The method for testing a receptacle is as follows (wall switches and light fixtures are tested in the same way):

    - Turn off the power to the receptacle at the breaker panel or fuse box. The proper breaker should be indicated on the suite-wiring plan.
    - Use a meter or a receptacle circuit tester to ensure that the power is off.
    - Tighten all electrical connections to the receptacle, and note any connections that have become loose. Look for signs of blackening or burning which may indicate that arcing may have occurred and damaged the receptacle.
    - Replace any receptacles that are no longer suitable. This includes the *push-in wire* type receptacles.

3. Have an electrician check the connections of all 240V items, such as the stove plug, all electric baseboard heaters and the suite electrical panel.

5.5 Emergency Power and Standby Batteries

Backup power for the building during local power failures comes in the form of wet/dry cell batteries and natural gas/diesel fuel-fired generators—depending on building size. All backup power systems should be routinely checked to ensure they are in proper working order.

5.5.1 Monthly Generator Test

Description: The generators should be tested under load for 60 minutes each month. A blank form of the ***Emergency Generator Test Log*** is located at the end of this chapter.

Action

1. Fill out the Standing Checks on the ***Emergency Generator Test Log*** form. (see ***Figure 5.6***)

2. Return all elevators to the ground floor, and take them off service.

3. Start up the emergency generator by manually switching the transfer switch.

4. After the emergency generator has operated for 60 minutes, fill out the Running Checks on the ***Emergency Generator Test Log*** form. (see ***Figure 5.6***).

5. Turn off the emergency generator by switching the transfer switch.

6. Make sure that all elevators are working properly.

Note:
Weekly tests may be required where fire authorities consider it important.

Figure 5.6 Emergency Generator Test Log Form

Emergency Generator Test Log

Building: _____
Building Operator: _____
Property Manager: _____ Month: _____

Standing Checks:

Date	Room Temp.	Room Heater	Gen Hours	Battery	Charger	Coolant	Block Heater	Oil Level	Fuel Level
1st		ON		OK	OK	OK	ON		
8th		ON		OK	OK	OK	ON		
15th		ON		OK	OK	OK	ON		
22nd		OFF		OK	OK	OK	ON		
29th		OFF		OK	OK	OK	ON		

Running Checks:

Date	Louvers	Volts	Amps	Oil Pressure	Engine Temp.	Frequency	Elevator Response
1st	Open	115	50	50	170	61.2	Elevator #1 worked fine
8th	Open	115		50	160	61.2	
15th	Open	115		50	165	61.3	
22nd	Open	115		50	160	61.1	
29th	Open	115		50	170	61.2	

Comments:

Transfer Test (Under Load) was done on March

5.5.2 Weekly Battery Check

Description: The battery should be manually checked every week.

Action:

1. Check the level of electrolyte.

2. Check the specific gravity.

3. Check the electrical connections for tightness leaks and sulphation. Also check for cleanliness and dryness between the terminal ports.

4. Check the charger for electrical connections, cleanliness and operation of both float and equalize modes.

5.5.3 Routine Maintenance

Description: Other preventative maintenance items that should be performed:

Action

1. Keep the battery terminals clean—grease them for protection.

2. Under NO circumstances should the emergency lights be more than **25 watts** per fixture. If too much power is drawn, the batteries will not last.

3. Call for service if on-site staff cannot fix emergency systems.

The standalone emergency light-battery pack unit should be checked. Test to see if the lights turn on (during a power failure) by pulling the plugs. The lenses should be kept clean.

5.6 Ground Fault Interrupters

Description: Ground fault interrupters are an additional fail-safe against electrocution. They detect when a current flows through the ground, through people/animals, or through any other object that is not intended to carry the current, and will snap the power off immediately. These

devices are usually installed near swimming pools and fountains, bathroom sinks and kitchen sinks, and they must always be activated.

Action

1. Ground fault interrupters should be tested monthly. Press the test button to ensure that the power is interrupted.

2. If the power is interrupted, reset the ground fault interrupter.

3. If the power is not interrupted, turn off the power at the breaker, fill out a ***Maintenance Request Form*** and forward the form to the property manager. Call an electrician immediately as problems with the ground fault interrupter are serious and must be corrected.

5.7 Motor Problems

Description: Most electric motor problems can be minimized by preventative maintenance and regular inspection. Overloading the motor is one of the most common problems, and can result in damaged motor insulation, melted soldered connections and burned out bearings.

Action

1. Inspect electric motors on building services and perform **"Look/Listen/Touch"** inspections to detect any warning signs. If there are any unusual smells, vibration, temperature changes or odd noises fill out a ***Maintenance Request Form*** and forward it to the property manager.

2. Keep motors and floor area around them clean.

3. Make sure there are no obstructions in the drive on the equipment.

4. Lubricate the motor bearings regularly according to the manufacturer's recommendations. Be careful not to over lubricate.

5. All service on the motor must be recorded on the maintenance tag on the motor. Record and date the maintenance performed. (See ***Figure 5.7***)

6. If the motor is replaced, the motor maintenance tag should go with the motor. A new tag should be attached to each new motor. A copy of a blank maintenance tag is located at the end of this chapter.

Figure 5.7 Motor Maintenance Tag

Tag Number:	P--5
System Type:	Building Htg. Loop
Serial Number:	91-55128
Model Number:	40-HEM
Manufacturer:	Canadian Motors
Size:	40 hp
	575/3/60
Service Co:	Joe's Mechanical
Phone Number:	555-7075
Maintenance Record	
Date	Type of Maintenance
1/92	Oiled Bearings
7/92	Oiled Bearings
1/93	Oiled Bearings
7/93	Oiled Bearings
8/93	Aligned Shaft
1/94	Oiled Bearings

5.8 Appliances

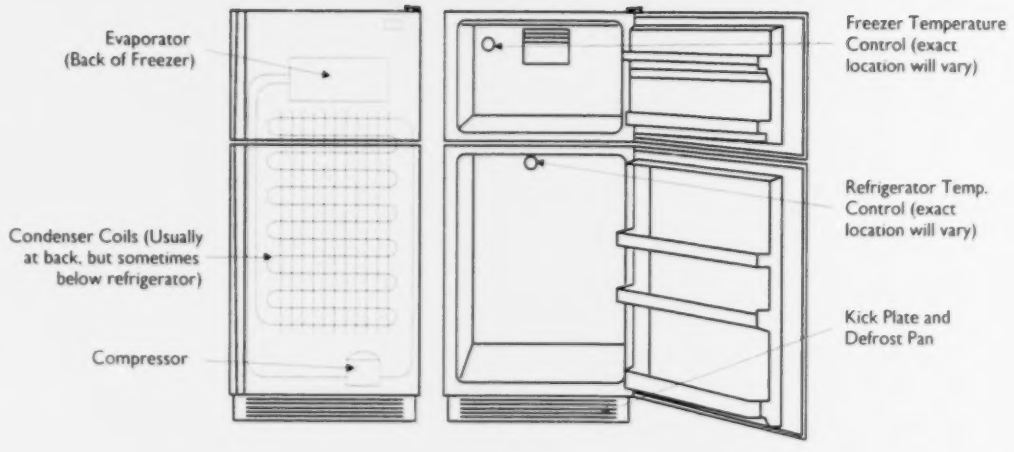
Problems with appliances are often detected by smelling a motor burnout or by hearing unusual or unfamiliar sound. The building staff can address most minor problems. If the problem is major, fill out a ***Maintenance Request Form*** and forward it to the property manager. Provide as much information as possible about the problem.

5.8.1 Refrigerators and Freezers

Description: Refrigerators and freezers operate on the following refrigeration cycle:

1. Heat is drawn from inside the unit by refrigerant gas at a low pressure and temperature in the evaporator coil.
2. The refrigerant gas goes to the compressor where it is compressed to a higher pressure and temperature.
3. Heat is rejected to outside the unit by high-temperature and high-pressure refrigerant in the condenser coils. The refrigerant gas cools and turns to liquid in the process.
4. The liquid refrigerant goes through a long capillary tube to the evaporator. Because of the pressure drop in the tube, the liquid refrigerant enters the evaporator at a low pressure, where it immediately expands (evaporates), its temperature drops, and the cycle repeats itself.

Figure 5.8 Typical Refrigerator


Evaporator
(Back of Freezer)
Condenser Coils (Usually at back, but sometimes below refrigerator)
Compressor
Freezer Temperature Control (exact location will vary)
Refrigerator Temp. Control (exact location will vary)
Kick Plate and Defrost Pan

Minor problems with the refrigerators and freezers can be fixed by building maintenance staff. Major problems require service by an appliance specialist. Diagnostic procedures are as follows:

Unit Will Not Run

Troubleshooting

1. Check that the unit is plugged in.

2. If the interior light is off, ensure that the breaker is not tripped or the fuse is not blown. Reset the breaker or replace the fuse as required.

3. Unplug the refrigerator and test the wall receptacle. (See 5.4 ***Wall Receptacles***)

4. If the light comes on when the door is opened, check whether the cold control dial is turned to the "ON" position. Switch to the "ON" position if required.
5. If the refrigerator will still not run, fill out a ***Maintenance Request Form*** and forward it to the property manager.

Unit Runs with Inadequate Freezer Temperatures

Troubleshooting

1. Make sure that the cold control is turned on to the coldest position. Some refrigerator controls are unclear as to which position is the coldest. Check with the manufacturer or check the refrigeration manual.

2. Check that the freezer door is properly sealing shut by ensuring that the magnetic sealed contact firmly with the refrigerator. If not, fill out a ***Maintenance Request Form*** and forward it to the property manager.

3. Clean the condenser coils (may be at the back or underneath the refrigerator). Use a vacuum or soft brush and be careful not to damage the coils. If the condenser coils are on the back of the unit, make sure that there is adequate room between the unit and the wall for air circulation. (10 cm—or refer to the refrigerator manual.) Cleaning the coils will allow more heat to be taken out of the refrigerator.

4. If the unit has a condenser fan, check that the fan is running. If the fan is not running, fill out a ***Maintenance Request Form*** and forward it to the property manager.

5. Check that the evaporator fan is running. If it is not running, fill out a ***Maintenance Request Form*** and forward it to the property manager.

6. Not all refrigerators will keep ice hard. The problem may be inherent with the refrigerator. There are no inexpensive ways of fixing this problem. Advise the tenant that items requiring the coldest temperatures (for example, ice cream) should be placed at the bottom of the freezer compartment and not on the freezer door shelf.

7. If the unit still will not maintain adequate temperatures, fill out a ***Maintenance Request Form*** and forward it to the property manager. The problem may be a refrigerant leak or a faulty compressor.

If the Building Electricity Supply Failed

Action

1. Advise tenants to keep the freezer and refrigerator doors closed. If the power will be off for four hours or less, no precautionary measures are necessary.

2. If the power will be off for longer than four hours, tenants should obtain ice or dry ice and place in the freezer compartment.

Excessive Running Time

Action

1. New model refrigerators are designed to maintain more even temperatures, and to do this, they must run for extended periods.

2. The food capacity of a new model refrigerator is greater, and thus there is more heat to remove.

3. If the unit is unusually noisy, fill out a ***Maintenance Request Form*** and forward it to the property manager.

Odours

Action

1. Empty and thoroughly clean the defrost drain pan under the refrigerator as it may be moldy. To do this, remove the kick plate to gain access.

2. Check the condensate drains to the drain pan for clogs. Flush the drains if they are clogged.

3. Cover all food and wash out the refrigerator with a baking soda and water solution.

4. Place charcoal in the refrigerator.

Excessive Frost Accumulation

Action

1. Advise the tenant that frost accumulates when the door is left open.

2. Check the door seal for possible leakage. Replace the seal or straighten the door on its hinges as required.

4. If there is still a problem, fill out a ***Maintenance Request Form*** and forward it to the property manager. Before the serviceman arrives, unplug the refrigerator for a couple of hours and allow it to defrost. A hair dryer may also be used to defrost the refrigerator more quickly. Never use a knife.

Policy Note:
Defrosting the freezer is the responsibility of the tenant.

Water on the Floor

Action

1. Check the drain pan. If it is full, empty it; if it is cracked, replace it.

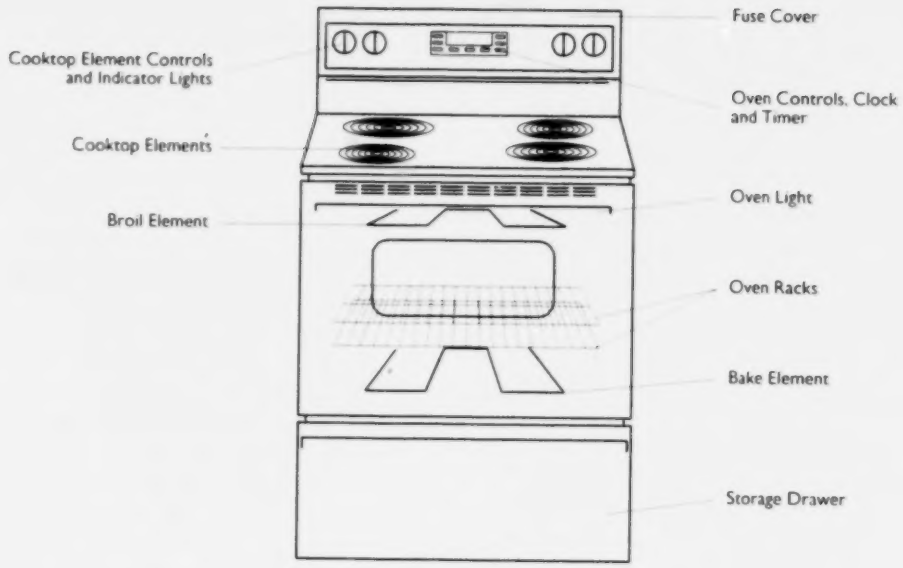
2. Check the drain lines to the drain pan. If they are clogged, flush them out; if they are broken or cracked, replace them.

Check the doors for condensate leakage. Door seals my have to be replaced.

5.8.2 Electric Range

Description: Most problems with electric ranges are due to blown fuses, tripped breakers, faulty or improperly set timers or defective elements. Major problems require service by an appliance specialist.

Figure 5.9 Typical Electric Range



Oven Will Not Heat

Troubleshooting

1. Check for a blown fuse or a tripped circuit breaker at the electrical panel.

2. Check for blown fuses in the stove. The fuses are usually located behind a panel by the oven and burner dials. (See *Figure 5.9*) Replace fuses as required.

3. Check that the timer is set to "manual."

4. Check that the temperature dial and the cooking method dials are properly set.

5. Check that the heat elements on top and bottom are working (Broil setting for the top element, normal baking for the bottom).

6. Check the wiring at the back of a failed element, by unscrewing the mount from the inside and inspecting the connections visually.

7. If there is still a problem, fill out a *Maintenance Request Form* and forward it to the property manager.

All Elements are Working, but Oven is Under-heating or Overheating

Troubleshooting

1. Check that the door is sealed when closed. If gasket is defective, replace it. If door hinges or springs are broken, replace them.

2. If oven overheats, check the vent for clogging and clean as required.

3. Remove aluminum foil from all oven shelves. Inform the tenant that the foil restricts heat circulation.

4. Check that the heat elements are working as detailed in the previous section.

5. If there is still a problem, fill out a ***Maintenance Request Form*** and forward it to the property manager.

Cook Top Element Will Not Heat

Troubleshooting

1. Check for a blown fuse or a tripped circuit breaker at the electrical panel.

2. Check for blown fuses in the stove. The fuses are usually located behind a panel by the oven and burner dials. (See ***Figure 5.9***) Replace fuses as required.

3. Check that the control dial is properly set.

4. Visually check element wiring for breaks.

5. Replace the element.

6. If there is still a problem, fill out a ***Maintenance Request Form*** and forward it to the property manager.

5.8.3 Gas Range

Description: Minor problems with the gas range can be fixed by building maintenance staff. Major problems require service by an appliance specialist.

Top Burner Will Not Light

Troubleshooting

1. If the pilot light is out, re-light it.

2. If the pilot light goes out again, partially close the mixer plate, and adjust the pilot to 2 cm.

3. If the ports in the burners are clogged, clean them with a pin or wire brush.

Gas Odour

Troubleshooting

1. Shut off the main gas valve to the suite. Advise building occupants not to use electrical appliances, lights and not to smoke. Open windows and doors from the apartment to outside (not the corridors).

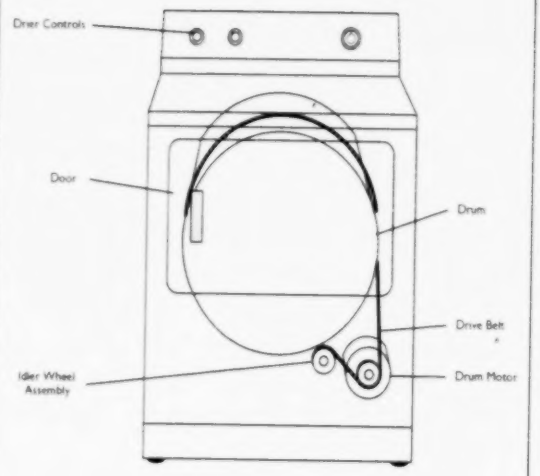
2. Call the gas company immediately.

3. Do not use the range until it has been checked and approved by a specialist.

5.8.4 Clothes Dryer

Description: Clean out clothes dryers in a common laundry facility daily. Minor problems with a central laundry clothes dryer can be fixed by building maintenance staff. Major problems require service by an appliance specialist. If there is a service contract in place, contact the service contractor directly. Otherwise, diagnose as follows:

Figure 5.10 Typical Clothes Dryer



Be careful not to take responsibility for servicing tenant-owned laundry appliances, as this can quickly become a major time commitment.

The interior of clothes dryers around the fan housing, drum and electrical connection should be vacuumed and cleaned annually. This requires disconnecting the electricity and dryer duct, moving the dryer and removing the rear panel. Dryer ducts should be inspected annually for accumulation. This can be done from the interior and exterior of the building. Lint accumulation is a fire hazard and prevents dryers from operating properly. Never vent dryers inside the building as moisture damage and mold growth can occur.

Machine Will Not Run

Troubleshooting

1. Check that the machine is plugged in.
2. Check for a blown fuse or a tripped circuit breaker at the electrical panel.
3. Check that the door is closed tightly.
4. Check that the drive belt has not been broken or disengaged.
5. If the machine will still not run, fill out a ***Maintenance Request Form*** and forward it to the property manager.

Machine Runs But Will Not Continue

Troubleshooting

1. Check for a blown fuse or a tripped circuit breaker at the electrical panel.
2. If there is still a problem, fill out a ***Maintenance Request Form*** and forward it to the property manager.

Machine Runs But Does Not Dry Clothes

Troubleshooting

1. Check and clean the dryer lint trap and exhaust duct. Remove all accumulated lint. Check the outdoor hood for lint accumulation or blockage (nesting birds) as well. Excessive lint build-up must be removed as it prevents drying action, and represents a fire hazard.

2. Check whether the machine is overloaded.

3. If the dryer vent system includes a booster fan, ensure the fan operates when the dryer is activated. If it does not, it likely needs replacing.

Drum Will Not Rotate

Troubleshooting

1. Open the unit and check that the drum is not being obstructed.

2. Check for a broken drive belt, broken idler wheel assembly or a worn support wheel. Make replacements and repairs as required.

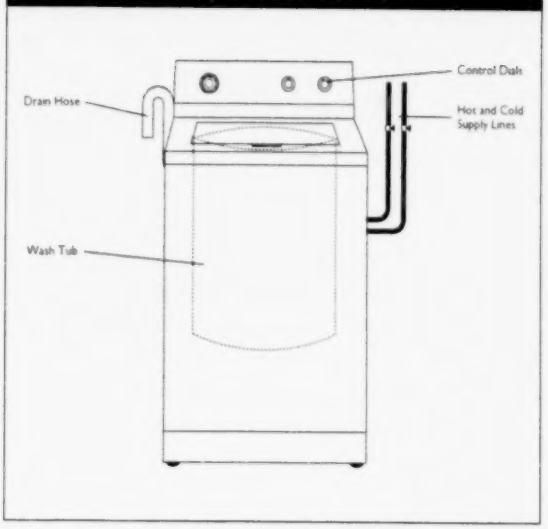
3. If the drum still will not rotate, fill out a ***Maintenance Request Form*** and forward it to the property manager.

5.8.5 Clothes Washer

Description: Clean out clothes washers in a common laundry facility daily. Minor problems with a central laundry clothes washer can be fixed by building maintenance staff. Major problems require service by an appliance specialist. If there is a service contract in place, contact the service contractor directly. Otherwise, diagnose as follows.

Be careful not to take responsibility for servicing tenant-owned laundry appliances, as this can quickly become a major time commitment.

Figure 5.11 Typical Clothes Washer



Machine Will Not Run

Troubleshooting

1. Check that the machine is plugged in.

2. Check for a blown fuse or a tripped circuit breaker at the electrical panel.

3. If the machine still will not run, fill out a ***Maintenance Request Form*** and forward it to the property manager.

Machine Does Not Fill Properly

Troubleshooting

1. If the washtub is not filling with water, or if it is filling with an incorrect water temperature, check that both valves on the hot and cold lines are open.

2. Check that the hoses on the machine are connected to the correct line. (for example, hot to hot, cold to cold)

3. Feel the hot water line. If it is cold, then the problem is with the hot water supply and distribution.

4. Remove the hoses from their faucets and clean the screens in the hoses and water inlet valves.

5. If the water only fills to a certain level, check that the top of the drain hose is at least 85 cm off the ground.

Machine Fills But Does Not Start

Troubleshooting

1. Close the washer lid, as it will not spin with the lid open. This is a safety item with most washers.

2. Check the motor and drive belt. If the belt is broken or loose, replace it. If the motor is not running, fill out a ***Maintenance Request Form*** and submit it to the property manager.

3. Check that there are not too many suds. "Suds lock" can interfere with good spinning and rinsing action. If the spin speed appears very slow and excess suds are present, put the load through a second cycle.

4. If there is still a problem, fill out a ***Maintenance Request Form*** and forward it to the property manager.

Vibration on the Spin

Troubleshooting

1. The load may simply be out of balance. Stop the washer and balance the load, then resume the cycle. Small loads tend to bunch to one side. Small throw rugs, bedspreads, mattress covers and blankets become off balance very easily. Always wash two small throw rugs together as one alone may throw the machine off balance.

2. Check that all four feet on the machine are firmly on the ground. Adjust the feet as required.

3. Unbalanced loads can also cause the machine to shut off if the vibration becomes too strong. The machine will reset itself when the wash cycle is reset.

Machine Leaks

Troubleshooting

1. Check that the hose connections are tight.

2. Check the hoses. If they appear cracked or otherwise deteriorated, replace them.

3. If the unit is still leaking, it may be the main shaft bearing seal. Fill out a ***Maintenance Request Form*** and forward it to the property manager. Unplug the unit, turn off the water and put an "Out of Order" sign on the unit.

5.9 Television Reception

An apartment building will either have cable service or an antenna on the roof. For the rooftop antenna, the signal is usually amplified through strip amplifiers before being distributed to the individual suites. If the building is on a cable system, all complaints should be directed to the cable company. Otherwise, use the following steps to remedy the problem.

Troubleshooting

1. If the problem is building wide, visually check that the antenna has not been damaged and that the amplifier has power. Also check the wires between the antenna and the amplifier. If the problem is not evident, contact the property manager or service technician approved by the property manager.
2. If the problem is specific to one suite, check the following:

    - Check that a proper round coaxial cable is being used between the wall plate and the set. Older sets may require a small adapter (transformer) to connect the coaxial cable to the set.
    - Check that the lead wires are securely attached to the set.
    - Check that there are no other attachments that could be a problem.

Further Reading

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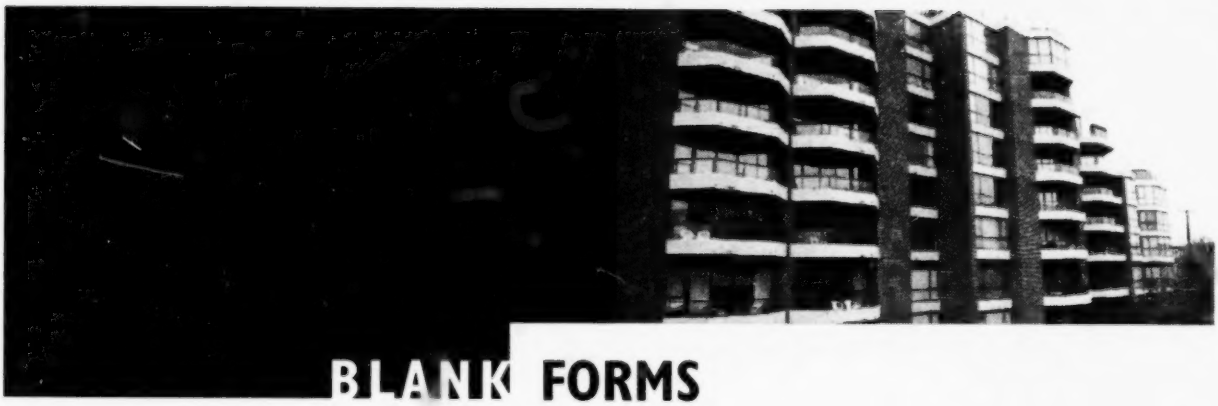


BLANK FORMS

Motor Maintenance Tag

Tag Number:	Maintenance Record	
System Type:	Date	Type of Maintenance
Serial Number:		
Model Number:		
Manufacturer:		
Size:		
Service Company		
Phone Number:		
Maintenance Record		
Date / Type of Maintenance		

Tag Number:	Maintenance Record	
System Type:	Date	Type of Maintenance
Serial Number:		
Model Number:		
Manufacturer:		
Size:		
Service Company		
Phone Number:		
Maintenance Record		
Date / Type of Maintenance		

Maintenance Request Form
-- General --

Building Address:	Floor:	Home Phone:
Resident's Name:	Suite:	Work Phone:
Request:		
Request Received By:		Date:

I, the undersigned, hereby acknowledge that I requested the maintenance described below to be done in my apartment. I expect that this work will be completed as soon as possible. I authorized the management staff, or if necessary, a contractor to enter my apartment during reasonable hours in order to complete the work. Notwithstanding my absence from the apartment at the time of entry, my signature on this request form shall be my consent to enter my apartment to do the work described below. Should more than one visit be necessary to correct the problem I also give my consent.

Resident's Signature:	Date:

Resident: Please fill out the above information and submit to the Superintendent. Do not fill out beyond this point.

A. Conditions in the Suite

Inspected By:	Date:

B. Action Taken to Fix Problem

Problem Corrected By:	Date:

C. Recommended Action Required

Recommended By:	Date:

D. Property Manager

Action Taken	Number	Who to Correct	Date Issued
☐ Work Order			
☐ Purchase Order			
☐ Resident to be Invoiced ?	☐ Insurance Claim #		

Work Authorized By:

Date:

Work to be Done:

Emergency Generator Test Log

Building: _____
Building Operator: _____
Property Manager: _____ Month: _____

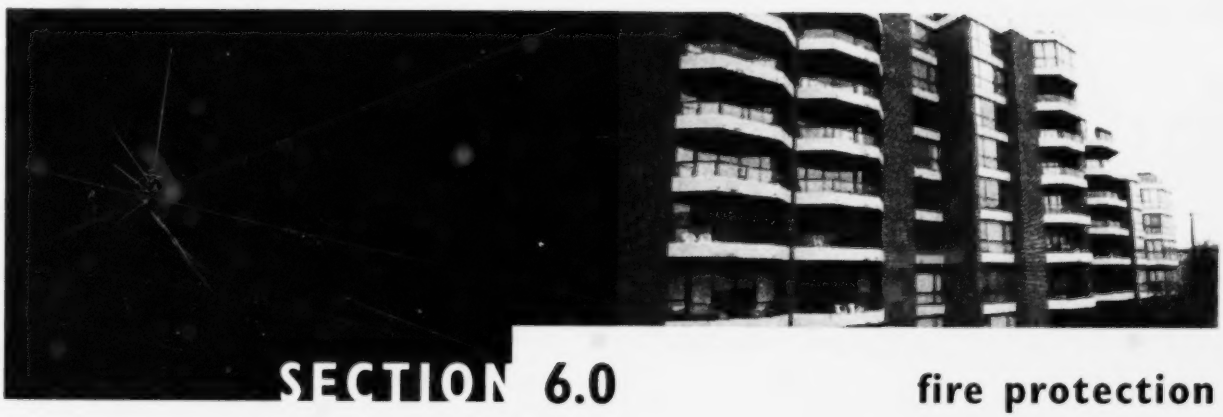
Standing Checks:

Date	Room Temp.	Room Heater	Gen. Hours	Battery	Charger	Coolant	Block Heater	Oil Level	Fuel Level

Running Checks:

Date	Louvers	Volts	Amps.	Oil Pressure	Engine Temp.	Frequency	Elevator Response		

Comments:



SECTION 6.0

fire protection

Section 6.0 Fire Protection

6.1 Introduction

This section covers most fire protection services and fire prevention practices. It also outlines what should be done in the event of a fire.

Legal requirements for fire protection are covered under provincial legislation. For example, Ontario has ***The Fire Code*** and ***The Fire Marshals Act***. These documents dictate the minimum requirements necessary for buildings. In instances where this manual varies from the provincial legislation, the legislation should take precedence.

6.2 Emergency and Fire Safety Plan

Description: An ***Emergency and Fire Safety Plan*** should be created for the building. The method of creating the plan is outlined in the **Operations Manual for Owners and Managers**.

The ***emergency procedures and organization, appointment and instruction of supervisory staff*** should be well known by all on-site staff.

6.3 Operating Procedures

Description: Evacuation of occupants is more important than fighting a fire. The following actions are standard "safe practice" procedures relating to fire safety:

1. Portable fire extinguishers (see ***6.6 Care of Portable Fire Extinguishers***) pull stations, sprinkler heads (see ***6.8 Automatic Sprinkler Systems***), fire pumps, smoke detectors (see ***6.4 Smoke Alarms and Smoke Detectors***), heat sensors, standby-batteries and enunciators must be properly maintained.

2. Fire doors prevent the spread of smoke and fire throughout the building. They are normally located between corridors and stairwells, corridors and apartments, corridors and lobbies, stairwells and lobbies, etc. They should never be blocked open. Some have fusible links that melt at certain temperatures and allow the door to close automatically in the event of a fire. Have spare fusible links on hand and ***never*** paint these links. Closures on fire doors must firmly close the doors. Door gaskets must be in good repair to prevent smoke movement.

3. Take care when storing flammable liquids. All paints and oils should be kept away from open flames and locked in metal-lined, ventilated closets. Use a Canadian Standards Association (CSA) or Underwriter's Laboratories (UL) certified container for gasoline (called a "jerry" can). Flammable liquids should not be poured from one container into another indoors.

4. Practice good housekeeping habits to keep storage areas, work areas and common areas free of debris and obstructions. Note that oils become fire hazards when they soak into floors.

5. Check that the instructions to the occupants in the event of fire emergencies are clearly posted and are in good repair.

6. Keep halls and stairs clear of boxes and other materials. Access to emergency exits and stairwells leading to exit doors must be kept clear and unobstructed. Stair treads must be in good condition and should never be slippery. Handrails must be firmly attached.

Emergency exit doors should NEVER be locked with a padlock or other locking device, or nailed shut. The door hardware should be kept in good operating condition.

7. Emergency exit doors allow direct exit from the building. These doors should be self-closing and only swing open to the outside. They are equipped with special hardware, popularly known as "panic hardware," which locks the door and does not allow it to open from the outside. However, the door can easily be unlocked from the inside by exerting light pressure on a pushrod.

8. Maintain safety in halls, stairs and equipment rooms by providing adequate lighting. Easily visible signs should identify all exits. Emergency lighting should be checked when testing the emergency transfer switch. (In accordance with the CSA Standard ***Emergency Electrical Power Supply for Buildings***)

9. Defective wiring causes many electrical fires. Wiring is affected by overloading, vibration, moisture, corrosion, heat and cold. These conditions weaken the insulation and can cause short circuits, arcing, and fires. Common causes of fires at circuit breakers are pitted contacts, loose parts, faulty installations and loose connections. Employ only competent and trained electricians to troubleshoot electrical wiring problems.

10. Never hesitate to call the fire department. Several major fires result from delayed alarms. Call the fire department and initiate the fire alarm if you see a wisp of smoke, if you smell a hint smoke, or if you spot a fire of any size. Evacuation of the occupants is more important than fighting the fire.

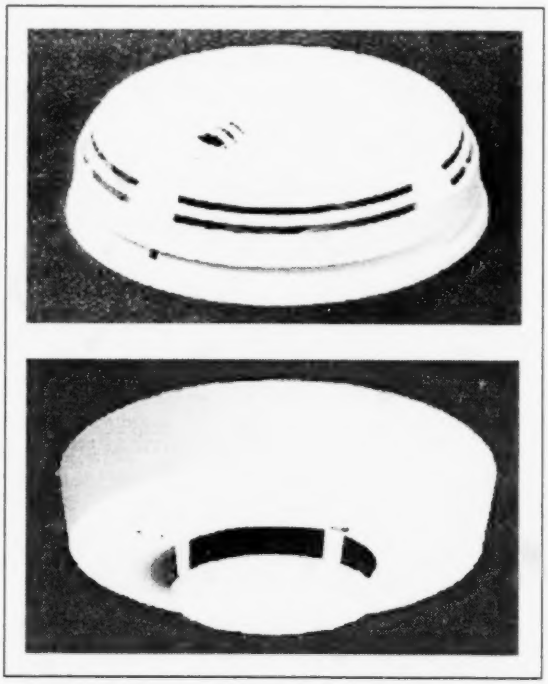
11. Fire action plans should be developed. Actions taken by the building operating staff prior to the arrival of the fire department will greatly influence the severity of a fire. For guidance in creating a formal ***Fire Safety Plan***, see the **Operations Manual for Owners and Managers**.

12. The following information should be posted in an accessible, secure location. On-site staff should know:

    - Names and phone numbers of who to call in case of an emergency.
    - Location and purpose of all shut-off valves, sprinkler lines, water, steam, fuel and other flammables.
    - Location of all switches that control the power and lighting.
    - How the fire protection system works.

6.4 Smoke Alarms and Smoke Detectors

Description: Smoke alarms and smoke detectors are often preferred to heat detectors because smoke from a young fire will set off the alarm before the heat builds up enough to set off a heat detector. Sometimes smoke alarms/smoke detectors can be set off due to smoke from cooking or steam from a shower. Once the smoke or steam clears, the alarm stops. Periodically, inspect all fire and smoke detectors to confirm and maintain their reliability.



Note: A smoke alarm is an independent unit that both detects smoke and sounds the alarm. Whereas, a smoke detector is a detection device connected to a central fire alarm system.

Action

1. Check the smoke alarms every month to confirm that the alarm works properly. Usually, there is a test button to check the alarm.

2. Ensure that battery-operated alarms are adequately charged. Dead batteries will render the alarm useless. Most units will beep when the batteries are weak. Batteries should be replaced annually.

3. If a suite does not have a smoke alarm, install one immediately.

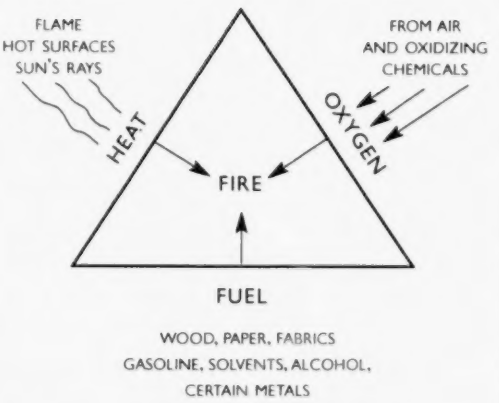
4. If the smoke alarm is electrically wired, an "on" light will verify that the unit is energized.

Never paint over a ceiling mounted fire or smoke detector and alarms.

6.5 Putting Out a Fire

The first priority of building maintenance staff is to ensure the safety of the building occupants. Only after people have been removed from the immediate vicinity of a fire, the alarm has been sounded and the fire department notified should any effort be made to actually fight a fire. Most couch and bed fires are relatively hard to put out and require special firefighting techniques and equipment. While such fires may seem small and manageable, their smoke can quickly overcome and kill those who are exposed to it. Firefighting is best left to professionals.

Figure 6.2 To competently combat fires, knowledge of the fire triangle is essential.



In the event that a fire can be quickly extinguished or the continuation or growth of the fire will threaten the building occupants, firefighting by on-site staff may be necessary.

To put out a fire, familiarity with various classifications of fires is necessary:

6.5.1 CLASS "A" Fires

Description: *CLASS A* fires involve ordinary combustibles, such as wood, paper and rubbish. To combat this type of fire:

Action

1. Try to remove the heat source, as it is likely impossible to remove the fuel or oxygen.

2. Water can be used to cool the fire. Portable water hand extinguishers and standpipes with fire hoses are useful in this instance.

6.5.2 CLASS "B" Fires

Description: *CLASS B* fires involve fire over the surface of flammable mixtures such as oil, paint, gasoline, thinners, etc. To fight this type of fire:

Action

1. If possible, remove the fire's fuel. The simplest way to extinguish a natural gas fire or a flammable liquid fire ***is to shut off the valve, thus cutting off the fuel supply.***

2. When the flammable liquid is in tanks or on a floor, the fire can be smothered, thus cutting off the oxygen supply.

3. Carbon dioxide (CO_2) extinguishers dilute the oxygen that the fire needs. Dry chemical extinguishers interrupt the chemical action as well as smother the fire.

WARNING: Never throw a stream of water on CLASS "B" fires. You may unwillingly splatter flaming liquids over a wide area, spreading the fire out of control.

6.5.3 CLASS "C" Fires

Description: *CLASS C* fires are in or near live electrical equipment. To put out this type of fire:

Action

1. *CLASS C* fires must be controlled with non-conducting material.

2. Carbon dioxide (CO_2) or dry chemical extinguishers must be supplied in all areas with major electrical equipment.

3. After the electric current has been cut off, water can be used to put out the fire.

Warning: Never use a water extinguisher on live electrical equipment. The electric charge may follow the water stream back to your body and you may be instantly electrocuted.

6.5.4 Fire Extinguisher Types

Extinguisher Types and Function Chart. **Each class of fire calls for specialized action. Using the wrong extinguisher may ultimately do more harm than good.**

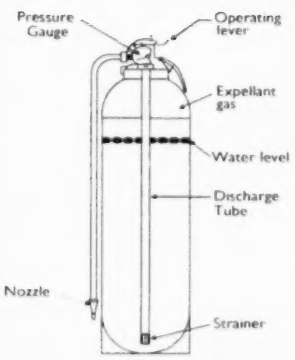
If the operator is unsure as to what extinguisher should be used on a fire, look on the side of the extinguisher. The following standard markings on the side will indicate the proper use for the particular extinguisher. (See ***Figure 6.4***)

Extinguisher Types and Function Chart

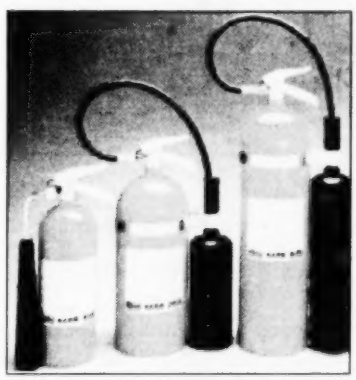
Extinguisher Characteristics	Carbon Dioxide CO_2	Dry Chemical	Water
Range of Stream	3 to 6 feet	10 to 15 feet	45 feet
Pressure Source	Gas compressed in cylinder.	Gas from pressure cartridge or internal pressure stored in cylinder.	Stored air pressure.
Recharging	After use. Weigh semi-annually to detect loss from tampering, etc.	After use. Weigh CO_2 semi-annually or check pressure gauge.	After use. Check pressure semi-annually.
Class "A" Fires Paper, wood, cloth, excelsior, rubbish, etc.	NO Not recommended for occupied areas.	YES—But Small surface fires only.	YES—Excellent Water saturates material and prevents rekindling.
Class "B" Fires Burning liquids, gasoline, oils, paints, cooking fats, etc.	YES—Excellent Carbon dioxide leaves no residue, does not affect equipment or food stuffs.	YES—Excellent Chemical smothers fire.	NO Water will spread fire, not extinguish it.
Class "C" Fires Fires in live electrical equipment (motors, switches, appliances, etc.)	YES—But Carbon dioxide is a non conductor, leaves no residue. Does produce condensation which could damage some equipment.	YES—Excellent Chemical is a non conductor. Screen of dry chemical shields operator from heat.	NO Water is a conductor and should not be used on live electrical equipment.

Figure 6.3 Types of Fire Extinguishers

Dry Chemical Fire Extinguisher

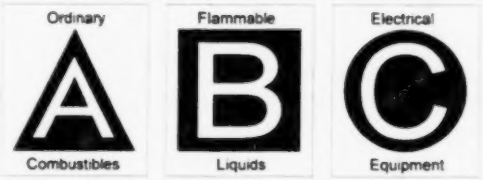


Water Fire Extinguisher



CO_2 Fire Extinguisher

Figure 6.4 These are standard fire extinguisher markings.



6.6 Care of Portable Fire Extinguishers

Description: Fire extinguishers require regular inspections and maintenance to ensure efficient and safe operation. The following should be checked at least annually:

Annual Inspections

Action

1. Check that the unit has not been activated and is fully charged—wire seals should be intact. The unit must be recharged immediately after every use, even if only partially discharged.

2. Make sure that the hose and nozzle are free of obstructions, and that the unit can be removed quickly from the rack.

3. Check for physical damage or deterioration.

4. Record the annual inspection date and initial the tag attached to the extinguisher.

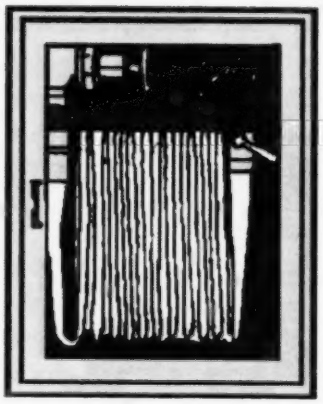
5. Make certain that any obstructions will not prevent quick access to the extinguisher and that its location is either clearly visible or properly indicated.

6. Check with local fire authorities regarding thorough off-site testing requirements.

6.7 Fire Hose System

Description: The purpose of the fire hose system (standpipe) is to supply firefighting water to all areas of the building. The fire hose should only be used if the fire cannot be put out using the fire extinguisher and should only be used by fire department personnel. All occupants should leave the building immediately in the event of a fire if it is safe to do so. Smoke-clogged corridors or stairwells may make it safer for persons to remain in their apartment. The following steps must be taken to ensure that the fire hose system works properly:

Figure 6.5 Fire Hose Cabinet



Monthly

Action

1. Check the fire hose stations to ensure that both the fire hose and the fire extinguisher are present and properly placed in an undamaged station.

Annually

Action

1. Remove the hose and re-rack it to change the locations of the folds.

6.8 Automatic Sprinkler Systems

Description: There are two principal types of sprinkler systems, (1) wet pipe, in which all pipes are full of water, and (2) dry pipe, which contain no water except during a fire. Dry pipe sprinklers are usually installed in garages and areas prone to freezing and contain no water except during a fire. Both systems activate when the fuse in the sprinkler heads melt—usually about 60°C allowing water through the head to spray the fire area.

Action

1. Sprinklers must be approved by the Underwriters' Laboratories (UL). A certified contractor as dictated by the property manager must perform all maintenance and regular inspections.

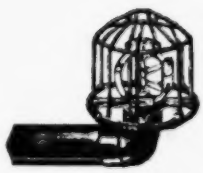
2. Keep a supply of extra sprinkler heads on hand, together with a sprinkler wrench, in a cabinet provided specifically for that purpose.

3. There is a standard colour code for sprinklers. Replacements should only be made with a head of the same colour as the head being replaced.

6.8.1 Routine System Checks

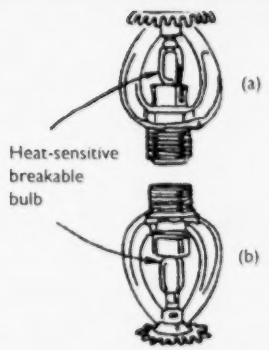
Description: The following inspections and tests should be performed on the sprinkler system.

Figure 6.6 Common Sprinkler Heads



Vandal Resistant

Heat-Sensitive Fuse



Heat-Sensitive Bulb

Weekly

Action

1. Ensure that all unsupervised control valves are locked open.

2. Check that the air pressure is being maintained in dry pipe systems. A constantly operating or heavy cycling of the compressor may indicate a leak. Dry pipe systems that leak air may eventually fill with water that can freeze if the pipes are in unprotected locations.

3. Check for freezing of pipes in the dry pipe valve room (cold weather only).

4. Drain any water from dry pipe systems (6.8.3 Drip Drum). The length of time between draining may vary depending on experience with the system.

Quarterly

Action

1. Test that the sprinkler system will sound the alarm system by using an alarm test connection. If the maintenance staff is not familiar with this procedure, have an experienced service person perform this test.

2. For convenience, coordinate with regular fire drills.

6.8.2 Air Compressor

Description: In a dry pipe sprinkler system, an air compressor is used to maintain pressure in the pipe. The following maintenance should be performed on a monthly basis:

Action

1. Lubricate the compressor motor if applicable.

2. Check the air filter for dirt by holding it up to a light. A filter that needs replacing will block out most (or all) of the light. Replace the filter if required. **Do not clean an air filter, unless it is specifically designed to be cleaned. The plastic and rubber seals on a filter tend to compress with age, allowing dirt to go past the seals into the compressor.**

3. Clean the compressor fins with a dry cloth or a vacuum cleaner.

4. Test the safety valve by pulling on the lever or ring. If there is a problem, call for service.

5. Check all belts for wear and replace them where necessary. **Replace all belts on the compressor at the same time.**

6. Inspect the electrical connections, pressure gauges, air lines, etc. for any abnormalities. Call for service if there is a problem.

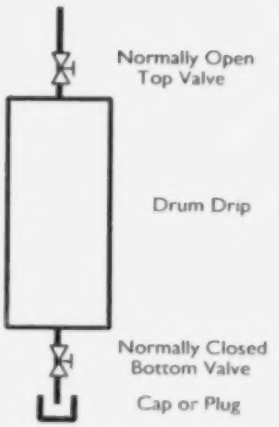
7. Operate the unit for 10 minutes, and observe any unusual noises, air leaks or vibrations. Call for service if there is a problem.

8. Change the oil in the compressor at least once a year.

6.8.3 Drip Drum

Description: A drip drum is a large pipe with isolating valves that is installed at low points in dry pipe sprinkler systems to collect water that may be in the system. They should be drained before winter and every time that water enters the dry pipe system. To drain the system:

Figure 6.7 Typical Drip Drum Arrangement



Action

1. Close the top valve.
2. Remove the cap or plug from the bottom of the drum.
3. Slowly open the bottom valve, and allow water to empty into a bucket or down the drain.
4. Close the bottom valve, and open the top valve.
5. Repeat steps 3 and 4 until there is no more water in the system. If there is still water after the 4th draining, or if there was no compressed air, call for service.
6. Replace the cap or plug, and make sure it is secure.
7. Close the bottom valve and open the top valve.

6.9 Fire Alarm System

Description: There are numerous types of fire alarm systems, and therefore, testing methods vary. A large building will have a sophisticated heat, smoke, annunciation and corridor/stairwell/elevator shaft pressurization system. A small building would more likely have a very basic alarm system. Regardless, the required tests and the frequency of these tests are common among the different systems. **Qualified contractors should do thorough electronic testing for complex systems.** The on-site staff should:

Daily

Action

1. Check the AC power indicator and trouble indicator lights.
2. Check the trouble conditions.
3. Check the central alarm control panel(s).

Monthly

Action

1. Check all fire alarm components, including pull stations, heat rise detectors, smoke detectors, etc.
2. Test the standby power to the alarm system.
3. Test the fire alarm system.
4. Test the voice communication between floors and central alarm control panel.

Annually

Action

1. Have the fire alarm system tested by a qualified technician.

6.10 Firefighting Water Supply Systems

Description: The firefighting water supply systems refer to the systems that supply water to the sprinkler systems, standpipe systems, hydrants, etc. The following maintenance schedules should be used to maintain the systems. While on-site staff can handle the daily maintenance schedule, it is suggested that weekly maintenance schedule be handled by qualified contractors.

Daily

Action

1. Check the temperature of the fire pump room during cold weather to confirm that temperatures that could cause freezing of the firefighting water systems do not occur.

2. Check the water temperature of fire protection water tanks during freezing weather.

Weekly

Action

1. Check the valves that control the water supply.

2. Check the water level and the air pressure for all pressure water tanks.

3. Check relief valves on air and water lines for pressure water tanks.

4. Check the water level of reservoirs.

5. Test the fire pumps. Allow them to operate for 10 minutes, and observe any unusual noises or vibrations. If there is anything unusual, have the pumps inspected by a qualified technician.

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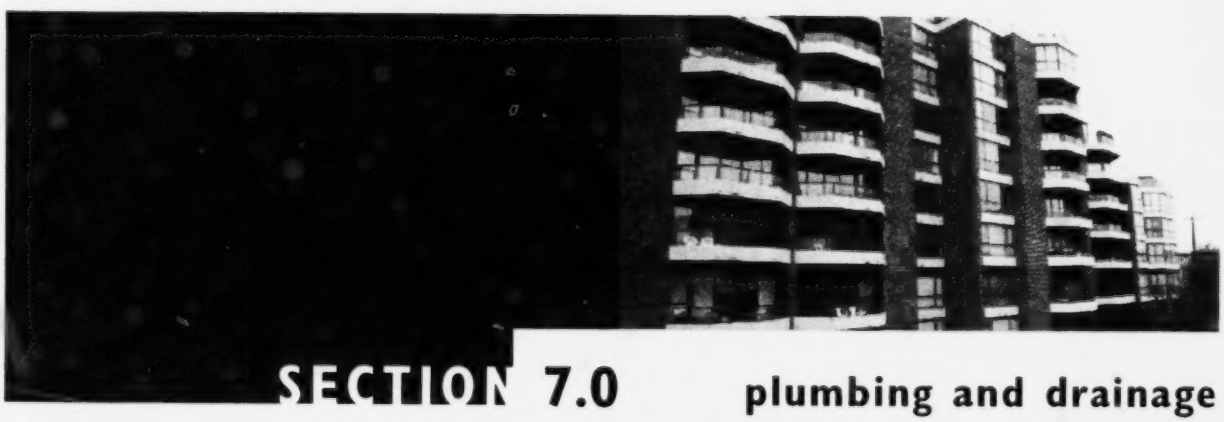


SECTION 7.0 plumbing and drainage

Section 7.0 Plumbing and Drainage

7.1 Introduction

This section covers common plumbing repairs, and the maintenance and care of plumbing equipment. Most plumbing repairs require the reassembling of parts by reversing the original process of removal. Take careful note of the parts as they are removed.

The smooth operation of plumbing systems and the quick repair of problem as they occur will not only limit complaints but also save money. Repair of leaking plumbing systems will also prevent damage to interior finishes and furnishings.

In some instances a qualified plumber or building permit may be required. Check with your local municipality for regulations.

7.1.1 Water Conservation

Water conservation is of utmost importance from both an environmental and an economic standpoint. Water conservation efforts should be worked into routine plumbing repairs and fixture replacement as they can be easily included without a significant incremental cost. Even though water and sewage costs vary greatly from one utility to another, the costs incurred from faucet and toilet leaks can be substantial. The chart below shows the 1995 costs for three Ontario municipalities.

If a hot water faucet leaks, the cost of heating the water increases the cost of the leak by about $0.10 /m^3.

	Annual Water and Sewage Cost			
	Annual Loss (m^3)	Etobicoke	Ottawa	Kitchener
Water and Sewage Rate (per m^3)		$0.88	$1.15	$1.37
One Drop per Second	1.5	$1.35	$1.78	$2.12
Two Drops per Second	3.0	$2.70	$3.56	$4.24
Drops Breaking to a Stream	31.8	$28	$37	$44
1.6 mm Stream	113.6	$99	$131	$156
3.2 mm Stream	354.0	$310	$408	$485
4.8 mm Stream	579.1	$507	$667	$794
6.4 mm Stream	1,260.4	$ 1,103	$1,451	$1,727

Water conservation devices that can be installed within the suite include:

1. ***Low-Flow Tap Aerators***. These devices mix air into the water stream, causing the water flow to be reduced while maintaining the look and feel of a full flow. They do not save water when filling a sink or a basin, but do save water when washing hands, vegetables, etc.

2. ***Low-Flow Shower Heads***. These devices are generally better at spraying the water, giving the feel of a full-flow showerhead with a fraction of the flow. Low-flow showerheads typically have flows of 9.5 litres per minute. Caution should be taken when selecting showerhead types, as some low-flow showerheads can be uncomfortable to use.

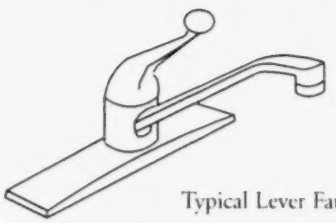
3. ***Low-Flow Water Closet***. In many municipalities where water is metered, the installation of low-flow toilets (13 litres per flush or less) is economically attractive. The water savings can pay for a toilet retrofit in as little as five years. Properly designed low-flow toilets perform as well as or better than conventional toilets that use 20 litres or more per flush. Look for references regarding preferred models when selecting a low-flush toilet. Ensuring that toilets do not leak will show significant water savings. Water seepage from the tank to the bowl can occur, continuously wasting a substantial amount of water each year.

Exercise caution by testing all water conservation devices in a single suite or several typical suites before installing them throughout the building.

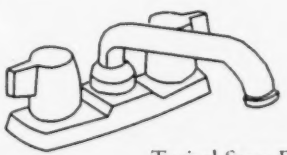
7.2 Faucets

There are three basic types of faucets for residential use. (See ***Figure 7.1***) The **stem faucet** has two faucet handles, one for hot water and one for cold. The **single lever faucet** has a single lever that controls both the temperature and the volume of water. The **wall-mounted faucet** that is used in showers, is similar to a single lever faucet, but can have different components such as tub-shower diverters, showerheads, etc.

Figure 7.1 Faucet Types



Typical Lever Faucet



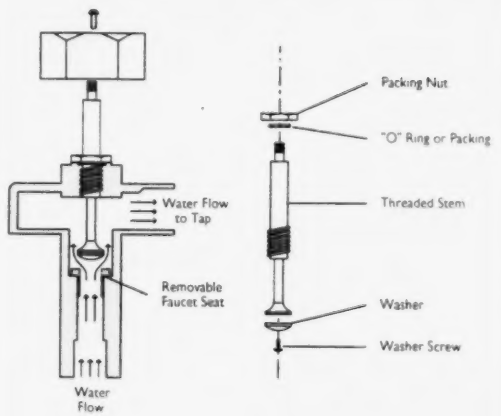
Typical Stem Faucet

Typical Wall Mounted Faucet

7.2.1 Stem Faucets

There are various styles of stem faucets and although the exterior appearances may vary, the operating principle is the same. Turning the faucet handle causes the threaded stem to be raised or lowered. At the base of this stem is a rubber washer. When the handle is turned to the open position, the washer is lifted from the faucet seat, allowing water to flow freely through the faucet body and out through the spout. When the handle is returned to the closed position, the stem is lowered, causing the washer to fit tightly against the seat, creating a watertight seal.

Figure 7.2 Typical Faucet and Valve Stem Assembly



Leaking Faucet

Description: The cause of a leaking faucet can be quickly traced to one of three common defects, all of which can be easily repaired by on-site staff.

1. The most common cause of leaks is a worn washer. A worn washer cannot maintain a watertight seal and should be replaced immediately. (See ***Replacing the Washer***)

2. Leaks sometimes develop between the stem and the faucet handle due to defective, worn packing, or a worn "O" ring. The leak can be easily corrected by simply changing the "O" ring. (See ***Replacing the Packing or "O" Ring***)

3. If a leak persists after changing the washer, the fault may be in the faucet seat. When the flat surface of the seat (against which the washer compresses) becomes rough, it will be impossible to prevent recurring leaks by merely installing new washers. Such roughness is caused by corrosion or by abrasion from sand and rust particles. If the seat is removable, it can be easily changed. If the seat is not removable, replacement of the entire faucet may be required. (See ***Replacing the Faucet Seat***)

If the faucet leak persists, replace the old faucet with a new faucet with better flow characteristics, a longer-life design and readily available parts.

Replacing the Washer

Description: A leak from the tap is usually the result of a worn washer.

Action

1. Shut off the water at the shut-off valve nearest the particular faucet.

2. Disassemble the faucet handle, packing nut, packing and spindle, in that order.

3. Remove the screw and the washer from the spindle. Clean out the cup and insert a new washer of the proper size.

4. Examine the seat of the faucet body. If it is scarred or rough, reface it with a seat-dressing tool. If re-facing fails, unscrew the faucet seat with an Allen wrench and replace it with another seat that is the same size.

5. Reassemble the faucet and turn on the water. Test and repair as necessary.

Replacing the Packing or "O" Ring

Description: If a faucet leaks around the stem when the water is running, new packing is required. Please note that modern faucets often use an "O" ring instead of packing.

Action

1. Remove the handle, packing nut and old packing (or old "O" ring.)

2. Install the new packing where the old packing was removed.

3. Re-install the packing nut and handle to the stem.

Replacing the Faucet Seat

Description: If a tap leaks after new washers have been installed, a new faucet seat is required.

Action

1. Remove the valve stem assembly.

2. Remove the faucet seat with a faucet seat wrench.

3. Install a new faucet seat.

4. Re-install the valve stem assembly.

7.2.2 Single Lever Faucets

Description: When a single lever faucet leaks, the entire lever mechanism, or even the entire faucet may need replacing. Identical replacement parts are required from the manufacturer, as the parts between different faucets are not interchangeable.

Note carefully how the faucet assembly fits together when disassembling the unit. Each faucet assembly is different.

Action

1. Disassembling the faucet usually involves removing the lever first. The setscrew that holds the lever is usually found by pushing the lever as far forward as possible (the full-open position). The setscrew is usually located at the base of the lever.

2. When repairing a leaking faucet, check for any worn "O" rings, valve seats, ball valves, etc. Also check for any broken springs.

3. Clean dirty parts or parts with lime deposits using an old toothbrush and soapy water.

4. Some units may require the replacement of an entire compartment.

5 If it still does not work properly, replace the entire faucet.

7.2.3 Wall Mounted Faucets

Description: Wall mounted faucets should operate for years without any problems. Generally, identical replacement parts are required from the manufacturer except for washers that are somewhat universal. In some cases, the entire unit may need to be replaced.

Note how the parts fit together when disassembling the unit as each faucet assembly is different.

Action

1. When repairing a leaking faucet, check for any worn "O" rings, valve seats, ball valves, etc. Also check for any broken springs.

2. Clean any parts that are dirty or have lime deposits using an old toothbrush and soapy water.

3. Replace any broken or worn parts with identical parts.

4. If the faucet is still not working properly, replace the entire faucet.

Tub-Spout Diverters

Description: If the tub-spout diverter is not working properly, the entire tub spout needs to be replaced.

Action

1. Take a piece of wood (a hammer handle or sawed off broom stick will work) and stick it into the tub spout.

2. Rotate the tub spout in a counter-clockwise direction.

3. If the spout does not rotate easily, fill out a **Maintenance Request Form** and forward it to the property manager.

4. If the spout rotates easily, remove it, and replace it with an equivalent sized spout.

Shower Heads

Description: In areas with hard water, it may be necessary to remove the lime from the heads on a frequent basis as it can clog the showerhead. Everyday use may erode parts of the heads.

Action

1. Remove the showerhead using a wrench. Put electrical tape on the wrench to protect the metal on the showerhead.

2. Disassemble the showerhead if possible. Use a toothbrush and soapy water to clean each component. If the lime or calcium build-up is heavy, use a cleaner designed specifically for lime and calcium removal.

3. If there are any worn or cracked parts in the showerhead, replace the head with a newer, more efficient model.

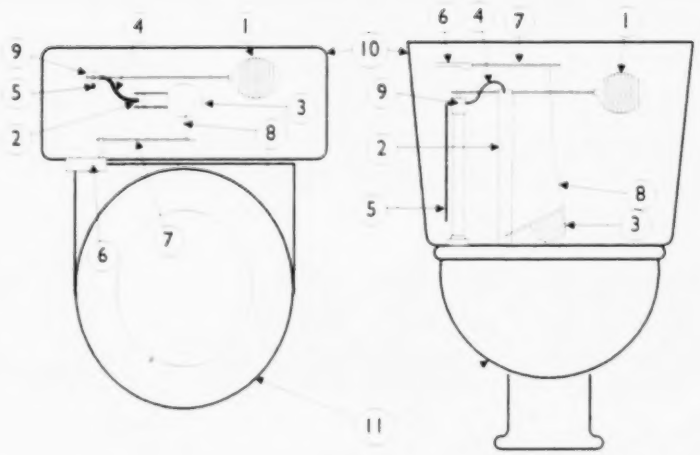
4. Reassemble the showerhead. Use teflon tape around the pipe threads and re-install the shower head.

7.3 Water Closets

All flush tank water closets (toilets) operate in a similar manner. They are similar enough that general repair instructions will apply for all designs. Parts that usually require repair are the flapper valve (3), the intake (float) valve (9), and the float (1). ***Figure 7.3*** shows the typical arrangement of a water closet.

Figure 7.3 Typical Parts of a Water Closet:

(1) Float
(2) Overflow Tube
(3) Flapper Valve
(4) Bowl Refill Tube
(5) Tank Refill Tube
(6) Handle
(7) Lift Arm
(8) Lift Chain
(9) Intake Valve
(10) Tank
(11) Bowl.



Possible variations to this arrangement are:

- Older water closets may have a brass ball valve instead of a flapper valve. In this arrangement, the lift chain (8) is replaced with a lift rod with a rubber tank ball at one end.

- Some newer water closets have the float (1) and intake valve (9) replaced by a single intake valve located at the bottom of the tank. The intake valve closes when the pressure at the bottom of the tank reaches a certain level, indicating that the tank is full.

7.3.1 Water Closet Leaks or Constantly Runs

Description: The most common problem with a water closet is leakage of water from the tank (10) into the bowl (11). Excess water in the bowl goes directly down the waste pipe. Water leakages result in major water and sewage costs.

Leaks may be detected by water movement in the bowl, the sound of water dripping or flowing within the toilet. A simple test is to place food dye in the toilet tank and watch for the colour to appear in the bowl. There are several possible causes of leaks, each of which must be checked:

Water is Flowing Over the Overflow Tube (2)

Description: Another common problem with water closets occurs when the water continuously flows over the overflow tube (2).

Troubleshooting

1. If the float (1) is not floating, replace it.

2. If the float (1) is floating, gently lift it up. If the water stops flowing, then the position in which the float (1) shuts off the intake valve (9) is incorrect.

3. If there are set screws located on the top of the intake valve (9), then adjust them until the float (1) closes the valve when the water is approximately 2.5 cm below the top of the overflow tube (2) or at the water mark noted on the tank.

4. If there are no setscrews, the rod between the float (1) and the intake valve (9) should be bent until the water is at the proper level. Take care to avoid damaging the intake valve (9) or breaking the rod.

5. If water continues to flow, regardless of the position of the float (1), then the washer in the intake valve (9) must be replaced.

Water is Leaking Past the Flapper Valve (3)

Description: A common problem with water closets happens when leaking occurs past the flapper valve (3).

Troubleshooting

1. If the lift chain (8) is tight, loosen it by adjusting its length or position on the lift arm (7).

2. If the lift chain (8) is loose and water is still leaking, then the flapper valve (3) is not closing properly. Shut off the water to the toilet, and drain the tank (by holding down the handle (6)). Check the flapper valve (3) and the seating for any wear or damage. Replace faulty parts.

7.3.2 Water Closet Does Not Flush

Description: This common problem with water closets occurs when pressing the handle (6) does not flush the toilet.

Troubleshooting

1. If the tank (10) is empty, make sure that the shut-off valve leading to the water closet is 100 per cent open. If the tank (10) does not fill, close the shut-off valve, and remove the intake valve (9). Open the shut-off valve just a little, to see if any water enters the tank. **Opening the valve too quickly or too far may spray water all over the washroom.** If water enters the tank, repair or replace the intake valve (9). If no water enters the tank, and other parts of the plumbing system work properly, fill out a ***Maintenance Request Form*** and forward it to the property manager.

2. Check the links between the handle (6) and the flapper valve (3). Repair or replace obvious problems.

3. Depress the handle (6). If the lift chain (8) is still loose, or the flapper valve (3) is barely lifted, adjust the lift chain (8) so that it properly lifts the flapper valve (3) without leaking when the handle (6) is not depressed.

7.4 Drainage System

The drainage system's function is to safely move wastes from a fixture to the sewer line, or to another means of disposal. Generally, the drainage system is divided into the following:

1. The stack
2. Waste pipes
3. Traps
4. Vents

7.4.1 Clogged Toilets

Description: Clogged toilets are one of the most common plumbing problems. Two solutions should be attempted before calling the plumber.

Action

1. Initially, use a plunger to clear the blockage. The plunger should be specifically designed for toilets. (A proper seal must be made between the toilet plunger and the toilet, allowing more pressure to be exerted.) For proper use, the cup of the plunger should be covered with water and completely filled with water. Tip the plunger under water to release any air.

2. If the plunger fails, use a closet auger (toilet snake), which will usually open the drain. Start the auger into the bowl and crank clockwise until the obstruction is reached, then pull back, cranking in the same direction.

3. If the toilet remains clogged, it must be removed.

Removing the Bowl

Description: Unless the person performing the repair is familiar with removing toilets bowls, it is best to have a plumber perform the work. The proper steps to remove a toilet bowl are:

Action

1. Shut off the water to the tank.

2. Empty the tank and bowl by flushing and holding down the handle. Excess water in the bowl can be removed by siphon or a sponge.

3. Disconnect the water pipe from the tank.

4. Disconnect the tank from the bowl if the water closet is a two-piece unit. This will make the bowl easier to handle.

5. Remove the seat and cover from the bowl to make it easier to handle.

6. Carefully pry loose the bolt covers and remove the bolts holding the bowl to the floor flange. Jar the bowl enough to break the seal at the bottom. Set the bowl upside down on something that will not chip or break it.

7. Remove obstructions.

8. Place a new wax seal around the bowl horn and press it into place.

9. Set the bowl in place and press it down firmly. Install the bolts that hold it to the floor flange. Draw the bolts up snugly, but not too tightly, or the bowl may break. The bowl must be level. Use a level on it while drawing up the bolts. Replace the bolt covers. If the bowl rocks, install shims under the base of the bowl.

10. Install the tank and connect the water pipes. It is best to replace all gaskets, after cleaning the surfaces thoroughly.

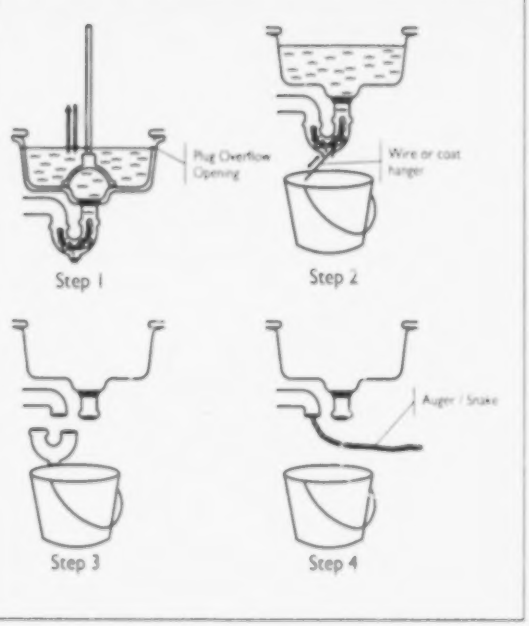
11. Test for leaks by flushing the toilet five or more times.

12. Install the seat and cover.

7.4.2 Clogged Basins and Sink Drains

Description: The procedure for clearing clogged basins and sink drains is illustrated in *Figure 7.4*. Do not use acids or drain openers on clogged drains. They can cause extensive damage to the drainpipes and they pollute the environment.

Figure 7.4 Steps to Unclog a Drain



Action

1. If the drain is not completely clogged, let the hot water run for five to ten minutes. This may be all that is required.

2. If the drain is completely clogged, use a suction cup plunger. Ensure that there is enough water in the sink to provide a seal. Make certain that the basket strainer is removed first. If the basin has an overflow, make sure to plug the opening before plunging. (***Step 1***).

4. If the plunger does not clear the drain, remove the cleanout plug as shown in ***Step 2***. Use a wire or a coat hanger to pull dirt out of the trap.

5. If there is no plug, or the sink is still plugged, remove the trap (***Step 3***). When loosening chrome nuts, cover the nuts with tape or a rag to prevent marring the finish.

6. If these actions are not successful, use an auger/plumber's snake (***Step 4***).

7. If the drain is still clogged, fill out a ***Maintenance Request Form*** and forward it to the property manager.

7.4.3 Clogged Floor and Shower Drains

Description: Clogged floor drains and shower drains can be cleared by using an auger or plumber's snake as outlined in *7.4.2 Clogged Basins and Sink Drains*. A second method is to use a garden hose.

Action

1. Remove the strainer from the drain.

2. Install a vacuum breaker (double check valve) to a nearby tap. A threaded adapter may be required. The vacuum breaker will ensure that sewage is not drawn back into the potable water system.

3. Connect the hose to the vacuum breaker.

4. Insert the hose into the drain, and pack rags around the hose.

5. While holding the hose and the drains, have someone turn the tap on full, then quickly turn it off.

6. Repeat ***step 5*** several times. If the drain remains clogged or drains slowly, fill out a ***Maintenance Request Form*** and forward it to the property manager.

7.5 Emergency Pipe Repair

Description: Permanent repairs to pipes should be performed by a plumber. In some cases, emergency repairs can be performed by the maintenance staff prior to the arrival of a plumber.

Action

1. When a leak is discovered, shut off the water on the supply side of the leak.

2. If possible, completely drain the section of pipe to make the repair work easier.

3. Dry the pipe as much as possible.

4. If the hole is small, jam a pencil point into it and break off the pencil. Wrap heavy tape over the patched hole. The tape should be several layers thick, and should extend for 4 or 5 cm on either side of the leak.

4. If the hole is large, make a lengthwise split in a small section of garden hose and place over the hole (so that the hose wraps around the pipe.) Fasten the hose using metal hose clamps or wiring.

5. Have the leak properly fixed as soon as possible.

Further Reading

Liska, Roger W., PE, Means Facilities Maintenance Standards, *R.S.Means Company Inc.*

Ontario Government - Ministry of Housing, Planned Maintenance Manual, *Queen's Printer for Ontario*

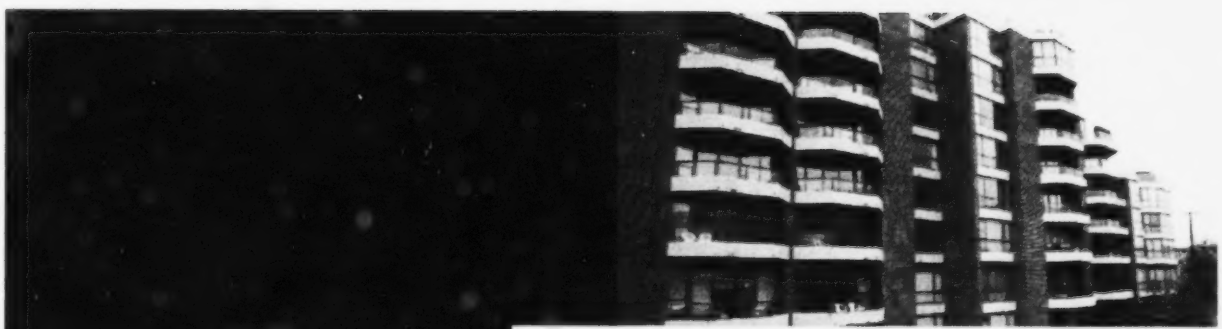
Ontario Government, A Guide to the Occupational Health and Safety Act, *Queen's Printer for Ontario*

National Standards of Canada, Manual for the Selection, Installation, Maintenance, and Field Testing of Backflow Prevention Devices, *Canadian Standards Association*

Resident Managers' Training Institute, Apartment & Condominium Operators' Manual, *Resident Managers' Training Institute*

Shear, Mel A., Handbook of Building Maintenance Management, *Prentice-Hall Inc.*

Shear, Mel A., Property Management Reinvented; How to Convert Maintenance and Energy Expenses to Profits, *Prentice-Hall Inc.*



BLANK FORMS

Maintenance Request Form
-- General --

Building Address:	Floor:	Home Phone:
Resident's Name:	Suite:	Work Phone:
Request:		
Request Received By:		Date:

I, the undersigned, hereby acknowledge that I requested the maintenance described below to be done in my apartment. I expect that this work will be completed as soon as possible. I authorized the management staff, or if necessary, a contractor to enter my apartment during reasonable hours in order to complete the work. Notwithstanding my absence from the apartment at the time of entry, my signature on this request form shall be my consent to enter my apartment to do the work described below. Should more than one visit be necessary to correct the problem I also give my consent.

Resident's Signature:	Date:

Resident: Please fill out the above information and submit to the Superintendent. Do not fill out beyond this point.

A. Conditions in the Suite

Inspected By:	Date:

B. Action Taken to Fix Problem

Problem Corrected By:	Date:

C. Recommended Action Required

Recommended By:	Date:

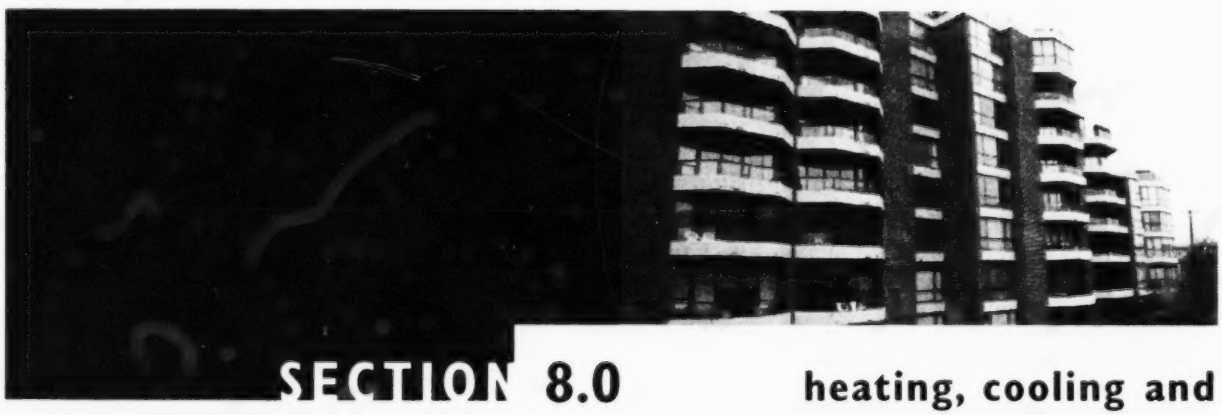
D. Property Manager

Action Taken	Number	Who to Correct	Date Issued
☐ Work Order			
☐ Purchase Order			
☐ Resident to be Invoiced ? ☐ Insurance Claim #:			

Work Authorized By:

Date:

Work to be Done:



SECTION 8.0

heating, cooling and other mechanical systems

Section 8.0 Heating, Cooling and Other Mechanical Systems

8.1 Introduction

This section covers the safety measures, daily inspection and service required for the building's mechanical equipment that is used for heating, cooling and ventilating all spaces and suites. Garbage compactors, elevators and overhead garage doors are also discussed. Operating, maintenance and corrective actions depend on on-site staff's expertise and the building's system type. When in doubt, call a qualified service contractor.

8.1.1 General Safety Measures

Description: The following safety measures should be practiced when working near fans and other rotating equipment:

1. Deactivate the equipment for service.

2. Ensure that belt guards are installed to prevent contact with fan blades or V-belts and other moving parts.

3. Never wear loose clothing, rings or neckties near rotating equipment.

4. Keep air ducts and coils clean. Replace air filters on a regular basis. Dust in the air handling system can act as fuel for a fire, prevent good airflow and cause indoor air quality problems.

5. Immediately turn off fan with excessive vibrations. Rotating fans have a high-energy content, and are very dangerous if they break up.

Be familiar with all refrigerant types (and associated hazards) used in the building.

Refrigerants used in high-pressure refrigeration equipment (D/X systems, heat pumps and some chillers) are in a vapour form at atmospheric pressure. When a rupture occurs in a central chiller plant, the lost refrigerant can quickly displace all of the air in the mechanical room. Anyone in the room could quickly be overcome by lack of oxygen if the supply and exhaust fans for the room are not turned on. If a major refrigerant leak occurs, get out of the room immediately.

8.1.2 Boiler Safety Measures

Description: The building operator should be familiar with the boiler and heating system, and know what the protective devices are and whether or not they are operating properly. The operator should also be familiar with the routine operation of hot water heating boilers, and know what action to take in an emergency.

Action

1. The boiler room should be kept clean, and all flammable items should be kept clear of the boilers and any hot surface.

2. All doors to the boiler room should be opened easily and kept clear of debris.

3. All doors to the boiler room should be kept closed. This is especially important for doors leading to a chiller room, or a storage room with refrigerants. Some refrigerants when burned cause toxic gases.

4. Boiler rooms with atmospheric boilers should not be under negative pressure. Do not operate an exhaust fan in the boiler room during heating season. Make sure doors between basement and ground floor boiler rooms are kept shut during the winter.

All boiler rooms require a make-up air assembly to supply combustion air. Ensure the make-up air system is operational at all times.

5. At the first hint of a natural gas leak, shut off the fuel to the boiler room (or to the building) and call the fire department and notify the gas utility. Natural gas smells like rotten eggs. (Natural gas is actually odourless; a sulfur compound is added to give an odour that is easily noticed.)

8.2 Hot Water Heating

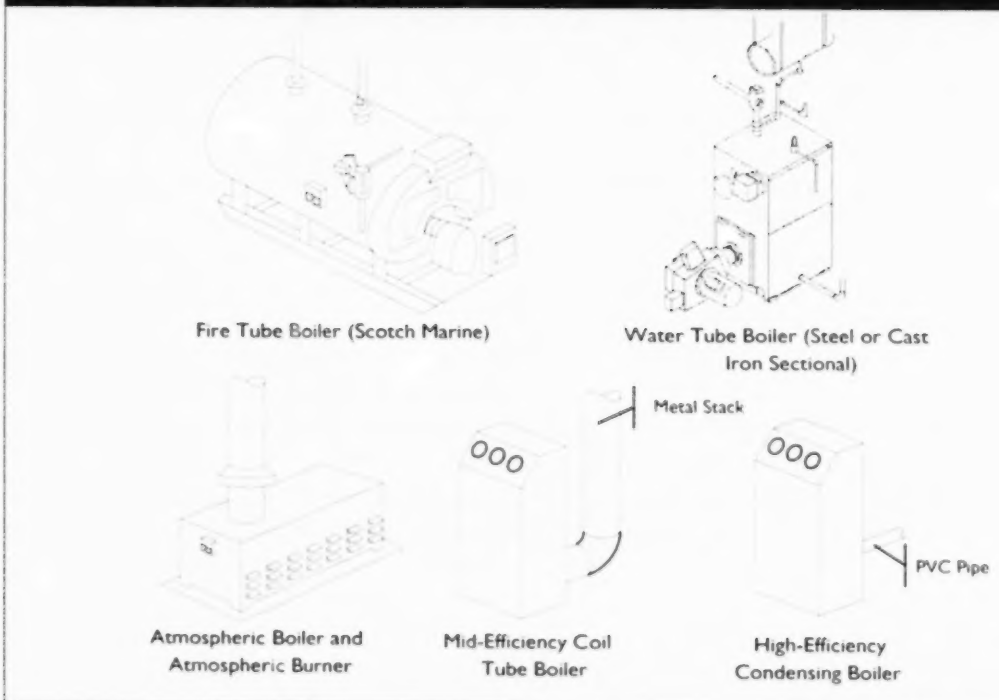
This section covers the routine maintenance of fuel fired hot water boilers. For electrical boilers, maintenance should be left to an electrician. The hot water boiler types that are covered include:

Note: The Atmospheric Boiler has an induced draft burner, while the other four have forced draft burners. All of these units can be designed to fire #2 oil, although the vast majority are natural gas fired. Water tube and fire tube boilers can have burners that are dual fired. (natural gas and oil)

8.2.1 Heating Water Temperature

Background: Many multi-unit residential buildings are heated by a boiler plant that delivers hot water to the perimeter of each floor. The temperature of that water is not kept constant, but is regulated automatically by an Indoor/Outdoor controller. If it is working, this controller causes hotter water to be delivered when the outside air temperature is colder.

Figure 8.1 Common Boiler Types.


Fire Tube Boiler (Scotch Marine)
Water Tube Boiler (Steel or Cast Iron Sectional)
Metal Stack
PVC Pipe
Atmospheric Boiler and Atmospheric Burner
Mid-Efficiency Coil Tube Boiler
High-Efficiency Condensing Boiler

There are two factors to keep in mind:

1. The correct regulation of the supply water temperature has a strong effect on fuel use.

2. Indoor/Outdoor controllers or associated elements often fail or perform poorly.

The ***Heating Water vs. Outside Air Temperature Relationship*** and the ***Heating Water Design vs. Actual Temperatures*** charts are used to check the operation of the controller.

The ***Heating Water vs. Outside Air Temperature Relationship*** illustrates the desired relationship between supply water and outside air. An example is shown to illustrate this relationship. Please note that the curve is not standard. The relationship may be slightly different for each building because reset controllers can be set by a controls mechanic to any desired relationship.

A lower curve decreases energy use but increases the risk of under-heating some suites. Verify the control setup with the building manager. Involvement of a controls contractor or mechanical engineer may be required. Boilers with certain piping designs can be damaged by water temperatures set too low. Once the correct relationship has been agreed and set up in the controller, use a blank chart to draw the control curve for the building.

The ***Heating Water Design vs. Actual Temperatures*** chart does not have to be set up in advance, but will be copied each month for daily recordings.

Charting Water Temperatures

Description: The distribution supply water temperature from the boilers should be recorded daily and compared to the desired control temperature. This can be done using the ***Heating Water Design vs. Actual Temperatures*** chart and the ***Heating Water vs. Outside Temperature Relationship*** chart (blank copies are located at the end of this chapter). ***Figure 8.2*** gives an example of how the temperatures would be plotted. (In this example an outdoor temperature of approximately -8°C was recorded on the 7th day of the month.)

Action

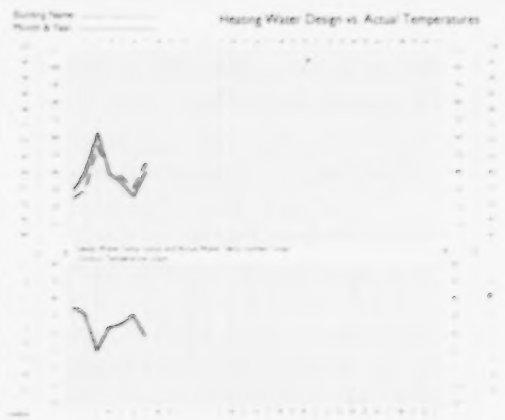
1. Read the *Outdoor Temperature* using an outdoor thermometer mounted away from heat sources and out of direct sunlight, or a hand-held thermometer if more convenient. Using the ***Heating Water vs. Outside Air Temperature Relationship*** (specific for the building), find the *Design Water Temperature*. For example, ***Figure 8.2*** shows that for an *Outdoor Temperature* of -8°C, the *Design Water Temperature* is 63°C.

2. Plot the *Outdoor Temperature* and the *Design Water Temperature* onto the ***Heating Water Design vs. Actual Temperatures*** and connect with the previous readings. In ***Figure 8.2,*** the *Design Water Temperature* is the solid line on the top left graph.

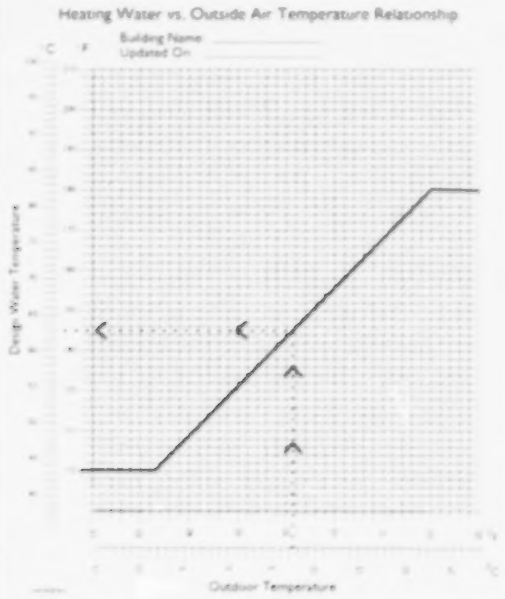
3. Read the *Actual Water Temperature* from a stem thermometer mounted on the heating supply pipe going out to the suites. If there is no suitable stem thermometer, a hand-held probe thermometer inserted through the pipe insulation (with the sensing tip in contact with the pipe) will do the job. Make sure the reading is from the temperature of the water that is being supplied to the building and not the return temperature or the boiler loop temperature. Plot the *Actual Water Temperature* onto the ***Heating Water Design vs. Actual Temperatures*** and connect with the previous reading.

In *Figure 8.2*, the *Actual Water Temperature* is the dotted line on the top left graph.

Figure 8.2



Sample ***Design vs. Actual Heating Water Temperatures*** *and* ***Heating Water vs. Outside Air Temperature Relationship***



This figure is a sample. The relationship for a particular building will depend on location and terminal heating equipment.

4. The *Actual Water Temperature* curve should match the *Design Water Temperature curve* fairly closely.

5. Over a period of weeks and months, a pattern will become clear. Ideally, the two temperatures will always be close and lines connecting the temperature points will be on top of one another. If one of the curves is always higher than the other, check the thermometers for accuracy, using a spare thermometer. Replace faulty thermometers. If all the thermometers are reading correctly, call a control contractor to adjust the Indoor/Outdoor Reset Controller. Indicate the time and nature of adjustments on the ***Heating Water Design vs. Actual Temperatures*** chart.

6. If the curves are drastically different and do not resemble one another, check that the outdoor temperature sensor is not affected by sunlight—it should be shielded from the sun and wind and should be mounted on a north or northwest exposure. Repeat the temperature measurements over the course of another week or so. If this is not the problem, issue a *Maintenance Request Form* to have a control contractor check the operation of the reset controller, the mixing valve and the boiler control.

8.2.2 Heating Maintenance Request Form

Description: Daily ***Look/Listen/Touch*** equipment inspections will identify most, if not all, central plant heating problems. Problems will arise within suites, and will typically be a malfunction of the in-suite equipment unless a building-wide heating problem occurs. Remember to inform the occupant when corrective action is performed.

1. When an occupant first complains about a heating problem, fill out the top section of the ***Maintenance Request Form***, and have the tenant sign and date it. Get as much information about the problem as possible. Information such as *"When did the problem start?" "Is the problem worse at certain times of the day, or during certain outdoor conditions?" and "What do you think the source of the problem is?"*, etc.

2. If the problem seems to be suite related, diagnose the problem. This step is critical in minimizing the total cost of the problem. The inspection should result in one of three decisions:
   i) Fix the problem immediately. (See Section 8.4 Suite Equipment)
   ii) Order the parts required to fix the problem.
   iii) Submit the ***Maintenance Request Form*** to the property manager in order to have the problem looked at by an outside service person.

3. Write down everything noticeable about the problem in ***section A*** of the form.

4. If the problem seems to be heating plant related (low-temperature water delivery for example), inspect the boiler room as soon as possible to diagnose the problem. Check boiler pressures and temperatures. Check that all of the valves are open and operating properly. Write down everything noticeable about the problem in ***section B*** of the form.

5. If on-site staff can fix the problem with available tools and inventories, get it done and write down the action taken in the ***Comments*** section of the form. If the on-site staff is not trained to fix the problem, forward the form to the property manager.

6. If the problem cannot be easily fixed, write down the recommended course of action in the ***Comments*** section of the form and forward it to the property manager.

Figure 8.3 Tenant Information, Problem Outline and Permission to Enter the Suite

Maintenance Request Form
– Heating –

A. Conditions in the Suite
To be filled out by the Superintendent during the initial suite inspection

B. Conditions in the Heating System
To be filled out by the Superintendent during the heating system inspection

C. Property Manager
To be filled out by the property manager to authorize repair work

8.2.3 Heating System Inspection (No Heat)

The heating system inspection checks various pressures and temperatures within the heating loop. (See *Figure 8.3*) These values should be within the ranges shown on the *Look/Listen/Touch Inspection* Form. (See *Figure 1.2*) If the values in the heating loop are not within this set range, a further diagnosis by a specialist is required.

Low-System Pressure (No heat on upper floors)

Description: This is usually caused by a leak in the system. The upper floor heating pipes fill up with air instead of hot water.

Troubleshooting

1. Check that the circulating pumps are operating.
2. Check that the valves in the make-up water line are open.
3. Ensure that all drain valves are closed.
4. Starting in the boiler mechanical room, check the system for leaks.
5. If a pipe is leaking, perform an emergency patch and call a plumber (see *Section 7.5 Emergency Pipe Repairs*)
6. If the leak is found in one of the pieces of equipment (pump, boiler, etc.) close the isolation valves on the pipes leading to the equipment after deactivation.
7. If the problem is not corrected, complete the *Maintenance Request Form* and forward it to the property manager.

High-System Pressures (System losing water at relief valve)

Description: This can indicate any of several problems, including leaking pressure-reducing valve, open by-pass line, water logged cushion tank, or inoperative relief valve.

Troubleshooting

1. Check the water level in the cushion tank. If the level is too high, fix the problem. (See *8.2.5 The Expansion Tank*)
2. Check that the bypass valves for the pressure-regulating valve in the make-up water line are not open. Close them if they are.
3. If the problem is not corrected, complete the *Maintenance Request Form* and forward it to the property manager.

Incorrect Boiler Water Temperatures

Description: Incorrect boiler supply and return temperatures can be caused by problems with the boiler or with the control of the boilers.

Troubleshooting

1. Boiler rooms typically have a boiler "ON/OFF" switch located at the entrance to the room. Ensure that the switch is in the "ON" position.
2. Check the settings on boiler operating control. Adjust up or down by no more than one or two degrees. Do not adjust the high-limit safety control.

3. Check that the fuses are OK and that circuit breakers are "ON".

4. If the problem is not corrected, complete the ***Maintenance Request Form*** and forward it to the property manager.

Building Loop Temperatures

Description: The building supply water temperature should be compared to the design water temperature (see ***8.2.1 Heating Water Temperature***). Supply water temperature is normally within 10°C of return water temperature.

Troubleshooting

1. Check that the boiler loop temperatures are adequate.

2. Check that the circulating pumps are running and all isolating valves are open. (Do not adjust any balancing valves)

3. Check the supply water temperature control (see ***8.8 Control Systems***).

4. Check the blending valve (see ***8.8.7 Central Hot Water Blending Valves)***

5. If the problem is not corrected, complete a ***Maintenance Request Form*** and forward it to the property manager.

8.2.4 Burner Malfunction

Description: The following is a list of symptoms and checks for forced draft burner problems. If after following these steps the burner will still not operate, call a qualified boiler service contractor.

If the burner motor does not start:

Action

1. Check the fuses at the main and secondary switches.

2. Push the red reset button.

If the burner motor starts, but the burner does not fire:

Troubleshooting

1. Make sure that the electric eye on the burner scanner is clean.

2. Check the flame failure resets—push the red button.

3. Check the oil level in the storage tank.

4. Check that the fuel oil transfer pump is operating.

5. Ensure that the oil valves to the burner are open.

6. Check the selector switch—it should be turned to "gas." (natural gas burners only).

7. If the problem is not corrected, complete a ***Maintenance Request Form*** and forward it to the property manager.

8.2.5 The Expansion Tank

Description: Expansion tanks are designed to allow for the expansion and contraction of heating water as temperature changes. There are two types of expansion tanks: diaphragm and non-diaphragm. The water level in a non-diaphragm tank should stay between one-third and two-thirds full.

Loss of Air in the Expansion Tank

Loss of air in the expansion tank will reduce cushioning ability. Reasons why this may occur include:

1. Leaks in the upper or air section of the tank, at the sight glass and around piping connections.

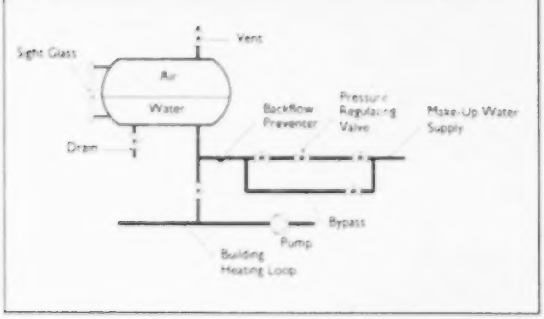
2. Air in the tank dissolving into the heating water.

3. The pressure relief valve on the expansion tank or boiler has failed causing over pressurizing of the heating system.

4. The water temperature in the system has increased, causing the water to expand and the air in the tank to compress. Regular inspections might indicate an increase in the expansion tank water level, or an increase of the system pressure. This may occur during the heating season, usually after a mild spell.

5. The by-pass valve around the makeup water pressure-regulating valve has been inadvertently left in the open position.

Figure 8.4 Typical Non-Diaphragm Expansion Tank and Water Make-Up



Re-establishing the Cushion

Description: When an expansion tank loses air, follow these actions to reestablish the cushion in the tank:

Action

1. Close the system supply valve to the expansion tank itself.

2. Connect a hose to the drain valve that is located either between the system supply valve and the cushion tank or on the tank.

3. When there is decreased water pressure, open the air-venting valve at the top of the tank to allow air in and water out.

4. When the water is completely drained from the expansion tank, close both the air venting valve and the drain valve, and disconnect the hose.

5. Slowly open the supply valve to the tank until it is in the full open position, and wait until the tank is filled with water to its normal level.

6. After the system has returned to the normal operating temperature and pressure, check the water level on the expansion tank sight glass.

Loss of Water in the Expansion Tank

The water level in the expansion tank can be lost in two ways:

i) Through a small leak at the pressure relief valve, through the boiler tubes, or through other piping in the system. When any of these conditions exist,

the pressure-regulating valve will not open even after a small but steady decrease in the system pressure is observed.

ii) Through a sudden rupture of the boiler tubes or the tube sheets.

Action

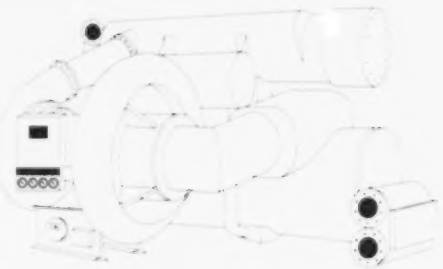
1. To temporarily correct the problem i) open the pressure regulating by-pass valve to bring the system back to the normal operating pressure. Once the pressure is normalized, close the by-pass valve and call a contractor for service.

2. When problem ii) occurs, isolate the boiler and start the second boiler (if one is present). Call a contractor for service. If there is only one boiler in the building, call for service immediately.

8.3 Cooling

This section covers air conditioning equipment such as chillers, cooling towers and direct expansion (D/X) systems.

Figure 8.5 Typical Centrifugal Chiller



8.3.1 Indoor Chillers

Description: A chiller is generally the largest, most expensive and most complicated piece of equipment found in multi-residential buildings. For this reason, maintenance and service should only be performed by a qualified licensed refrigeration mechanic.

Action

1. Regularly compare the chiller set point temperature with actual chilled water temperature. Use a minimum chilled water temperature setting of 8°C, and adjust higher whenever possible for best efficiency.

2. Set the demand-limiting dial as low as possible to achieve the required cooling. It is better for a chiller to run longer at lower capacity than to cycle on and off frequently at high capacity.

3. If the set point chilled water temperature can not be met (with the demand-limiting dial at 100 per cent) call for service.

4. Surging of the compressor results from refrigerant condensing before it should, and falling back into the compressor. It usually occurs at low load, and produces a noise as though the chiller were continuously "shifting gears." The loading and unloading of the compressor motor will be quite apparent. If the chiller is surging, turn it off and call for service.

8.3.2 Air-Cooled (Rooftop) Chillers

Description: An air-cooled chiller is a packaged unit with all components in a single cabinet. A qualified licensed refrigeration mechanic should perform maintenance and service.

Action

1. Regularly compare set point with actual chilled water temperature. Use a minimum chilled water temperature setting of 8°C, and adjust higher whenever possible for best efficiency.

2. Set the demand-limiting dial as low as possible to achieve the required cooling. It is better for a chiller to run longer at lower capacity than to cycle on and off frequently at high capacity.

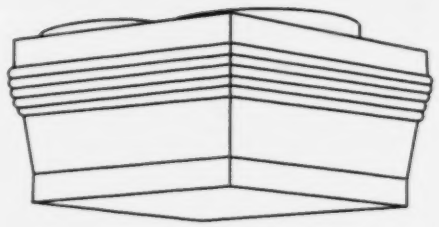
3. If the set point chilled water temperature can not be met with the demand-limiting dial at 100 per cent, confirm condenser air flow. Check that the condenser fans are operating and that the condenser coil is not blocked with debris or plugged with dirt.

4. If the problem cannot be found, or inadequate cooling persists, forward a ***Maintenance Request Form*** to the property manager.

8.3.3 Cooling Tower

Description: Indoor chillers need cooling towers to reject heat to the outside. Cooking towers are sometimes used to cool the water in water source heat pump loops. Condenser water is pumped to the cooling tower, where it is sprayed or dripped to come in contact with outdoor air. The water rejects heat to the air through evaporative cooling. (This is the same principle that makes a damp towel cooler than a dry towel.) The tower cools the condenser water (to around 30°C) by varying the airflow.

Figure 8.6 Typical Cooling Tower



If the tower does not seem capable of maintaining the required condenser water temperature, the following checks should be made:

Troubleshooting

1. Check the condenser water set point on the control and adjust accordingly. (See ***8.8 Control Systems***)

2. Check that the fan motor is running at full speed and that belts connecting the fan to the motor are not slipping.

3. Check that the dampers on the cooling tower are wide open.

4. Check that the make-up water to the cooling tower is operating correctly. A float and intake valve, similar to those on a water closet, control make-up water.

5. Ensure that the airflow in the cooling tower is unrestricted by paper or other debris.

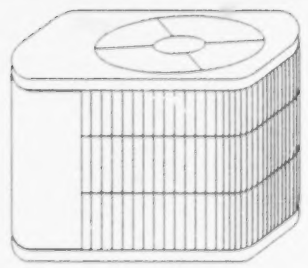
6. Check that water flow is even across the tower. Clean out nozzles or orifices if needed.

7. If the problem cannot be fixed by the on-site staff, fill out a ***Maintenance Request Form*** and forward it to the property manager.

8.3.4 Direct Expansion Systems

Description: Direct Expansion (D/X) cooling systems do not use water as a heat transfer medium. Instead, refrigerant is used to move heat between the cooling coils of the air handling system and an outdoor condenser. These systems are often called split systems, because the compressor/condenser unit is physically separated from the cooling coil. A heat pump is a type of D/X system equipped with a reversing valve to allow heat to flow either way, depending on space heating and cooling requirements. D/X systems are generally used in common areas of the building such as lobbies, recreation areas, etc. They can also be found within individual apartments when the outside condenser unit can be placed on a balcony or rooftop area. Service of D/X units should be left to a qualified contractor. However, simple troubleshooting may solve some probes before a service call is required:

Figure 8.7 Typical D/X Compressor/ Condenser Unit



Inadequate Cooling

Description: The direct expansion cooling system is not working properly resulting in inadequate cooling.

Troubleshooting

1. Check electrical power to the unit.
2. Check thermostat setting and adjust if needed.
3. Check that the indoor air-handling fan is operating and the belts are not slipping.
4. Check that the indoor filters of the air-handling unit are not clogged and all dampers in the ductwork are fully open.
5. Check for restrictions in the ductwork. If there are restrictions, (clogged filter, closed fire damper, etc.) shut off the system immediately. With a reduced airflow, the coil in the duct can quickly freeze and possibly crack. Coils in the air-handling system can sometimes freeze over causing poor cooling performance. If this happens, the stem should be deactivated until the coils freeze. Coil freeze up is often due to inadequate airflow caused by clogged filter, closed dampers or improper fan speed settings.
6. Check that all fire dampers are open. The dampers should be located at any point where the ductwork goes through a rated firewall. There will be an access door in the duct.
7. Check that the outside condenser fan is operating and that the condenser coil is not blocked with debris or plugged with dirt.

8. If the system is unable to maintain the req red temperature, it may need to have the refrigerant recharged. A refrigeration mechanic is required for this as a need for recharging is often caused by a leak in the system. Leaks must be repaired before systems can be recharged. Fill out a ***Maintenance Request Form*** and forward it to the property manager.

Other Problems

Troubleshooting

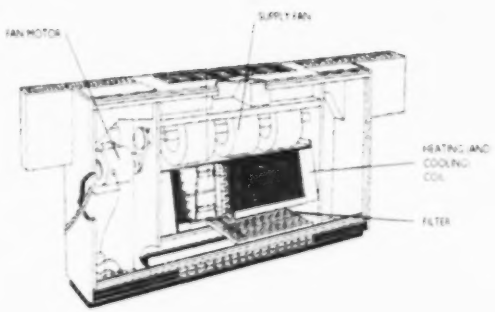
1. Make sure that all refrigerant lines are well insulated. Non-insulated lines cause condensation to form on the lines which can wet interior finishes and furniture.
2. If the compressor is making loud or erratic noises, call a qualified refrigeration mechanic. The compressor is a hermetically sealed unit that usually needs replacing when something goes wrong.

8.4 Suite Equipment

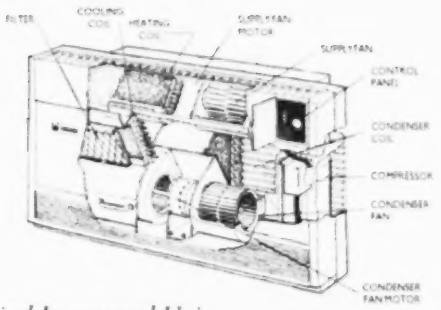
Description: There are many types of in-suite equipment used for heating and cooling.

Figure 8.8 shows the three basic types of hydronic heating and cooling equipment. Each unit uses common components (fans, valves, coils, etc.); therefore, the diagnosis and action required to fix most problems are similar to other methods outlined in this section.

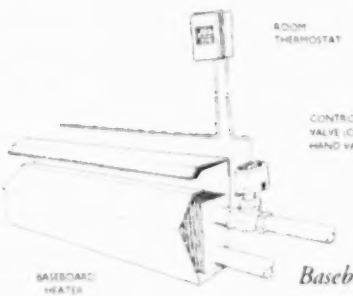
Figure 8.8



Horizontal Fan Coil Unit. Vertical fan coils are often installed in closets. In this case the fan will be mounted below the heat/cooling coils and the top discharge will be ducted. Fan motors, coils and filters in these units require regular maintenance.



Typical Incremental Unit



Baseboard Heater

Fan-Coil and Incremental Units

Description: Fan-coil units and incremental units (sometimes called PTAC units) operate by drawing air from the room, passing it through a heating or cooling coil, and delivering the air back into the room. A fan-coil unit uses hot water and/or chilled water from central heating and cooling plants. An incremental unit uses refrigerant within the unit to cool the air during the summer. Incremental units may also introduce outside air to the space. Most of these units have filters and coils that must be cleaned regularly. Condensate pans and drains are often in the units. These require cleaning as well to prevent the growth of mold.

Heating or Cooling Complaint

Description: Should there be a heating or cooling problem in an apartment equipped with fan-coil or incremental units, the following procedure can be used to identify the problem:

Troubleshooting

1. Check and adjust the thermostat. As the thermostat is turned up or down, it should make a faint click as the internal contacts close to activate the heating or cooling cycles. If no sound is made the problem may be the thermostat. Replacement is usually the most cost-effective solution.

2. Confirm electric power is being supplied to the fan motor and compressor motor (if one exists).

3. Check that any operable dampers are moving properly and are fully open.

4. Check that there is sufficient air movement by confirming fan operation and confirming that the filter and coil are not plugged.

5. Confirm water flow by feeling the pipe temperature at the coil inlet and outlet. If the pipe is not hot or cold (depending on the season), check that the isolation valves (usually installed where the water pipe feeds into and out of the unit) are open. Open manual air vents to let air that might have accumulated in the coil out.

6. Refer to other sections on ***Emergency Pipe Repair, Air Handling Units, Electric Motors***, and ***Control Systems*** to correct other problems.

7. If there is still a problem, complete a ***Maintenance Request Form*** and forward it to the property manager. In extreme weather conditions, replace the unit with one from inventory or provide plug-in type electric heaters.

Noisy Unit

Description: At times, the unit may emit unnecessary noise.

Troubleshooting

1. Shut off power to the unit.

2. Open the cover.

3. Inspect the area of the fan-motor area for obvious noise sources. Remove any debris as required that may be causing noise when the fan turns. Confirm that the fan-motor assembly is firmly mounted and there are no loose housing, ductwork or frame assemblies. Tighten as necessary. Loud compressor-related noises might indicate a problem with the compressor that needs to be addressed by a service contractor.

4. If there is still a problem, complete a *Maintenance Request Form* and forward it to the property manager.

Baseboard Heaters and Radiators

Background: Baseboard heaters use natural convection and radiation to heat the space. The baseboard heater can be electric, hydronic or steam. The hydronic and steam units should have thermostatic valves on them to control heating. The valves are typically electric and controlled by a wall thermostat. Isolation valves should also be installed so the unit can be serviced or replaced without having to shut down the entire building space heating system.

Sometimes a hand valve is used instead of a controlled electric valve. The temperature in the suite is controlled by resetting the boiler water loop with the outdoor air temperature. The tenant then fine-tunes the temperature in the apartment by opening or closing the hand valve or adjusting the thermostat. All baseboards require cleaning to ensure that the internal heat transfer surfaces work properly and do not cause a fire hazard. The coils in baseboards should be vacuumed annually.

Response to Heating Complaint

Description: Use the following to trouble shoot heating complaints.

Troubleshooting

1. Check and adjust the thermostat. Confirm that the thermostat is working by listening for the clicking sound made as the internal contact closes when the thermostat is adjusted up or down.
2. Check that there is nothing blocking natural convection through the baseboard such as carpets, curtains and furniture.
3. For hydronic baseboards, confirm water flow by feeling the pipe temperature at the coil inlet and outlet. If the pipe is not hot, check that isolation valves are open. Open manual air vents to let air that may have accumulated in the radiator out.
4. If there is still a problem, complete a *Maintenance Request Form-Heating* and forward it to the property manager.

8.5 Central Makeup Air and Exhaust Systems

In many apartment buildings, air is supplied to the corridors on each floor from a central air-handling unit. This unit draws air in from outdoors through an outdoor air grille, passes the air through a filter and heating coil, and then delivers it to each corridor. Air is usually exhausted from the kitchens and bathrooms of each apartment by central rooftop exhaust fans or by fans located in the apartments that are ducted horizontally out though the walls of the building.

While being fairly simple, these systems require routine maintenance to ensure that they work properly:

8.5.1 Air Ducts

Description: Periodic cleaning of air duct systems is important, as failure to do so results in fire hazard and limits airflow. Ductwork should be inspected professionally every five

years and cleaned if necessary. More frequent cleaning may be required if the annual inspections indicate significant buildup of dust and debris. In that case, forward a ***Maintenance Request Form*** to the property manager.

Action

1. Visually inspect the air ducts annually by removing grilles at various locations, to assess the accumulation of dust, grease or foreign materials. Filters and coils in the air-handling unit need to be cleaned on a regular basis.

2. Examine the outside fresh air screens. Ensure there are no combustible materials near the intakes.

3. Fire doors and fire dampers should be checked once a year to make sure the hinges and other moving parts are in good operating condition. Check that fire dampers are open and replace fusible links that have failed.

4. Make sure that the outside air intake damper is operating properly. It should close off the air intake grille when the air-handling unit is shut down.

In-Suite Fan and Grille Cleaning Before New Occupancy

Description: Exhaust grilles in apartments eventually become laden with dust and grease. This prevents proper airflow. Exhaust grilles should be cleaned annually. At the same time, the proper operation of the kitchen and bathroom exhaust systems should be confirmed. Outdoor hoods and grilles should also be inspected and cleaned at this time.

Action

1. Remove exhaust grilles in the washroom and kitchen.

2. Clean or replace exhaust grilles.

3. Clean out any accumulation around the fan housing and ducts as far as the arm can reach.

4. Airflow can be confirmed by feeling for air movement at the exhaust grille or by placing a sheet of toilet paper over the grille. If there is adequate airflow, the paper should be held tightly to the grille.

8.5.2 Fan Inspection

Description: Fans are used to move air from place to place in a building. They are also used in space heating, and cooling systems can become a potential danger to life or property if they are improperly used or improperly maintained.

Action

1. Fans used in warm air, ventilating, or air conditioning systems may be driven directly from the motor shaft or through a belt drive. In every case, where a rotating part such as a shaft or a belt is exposed, a suitable guard must be present.

2. Fans without ductwork present an additional hazard in their ability to draw in and blow out loose materials. Solid objects or loose material can be discharged as dangerous projectiles.

3. Access doors should not be opened when the fan is running. A preliminary check should be made before starting the fan to assure that there is nothing in the ductwork.

4. When excessive vibration is observed, immediately shut down the fan.

5. A contractor must service fans. Forward ***Maintenance Requests Forms*** to the property manager.

8.5.3 Fan Maintenance

Description: Fan problems are usually detected by unusual noises. Corrective action is dictated by the nature of the noise.

Vibration

An out-of-balance fan wheel usually causes fan vibrations.

Troubleshooting

1. Stop the fan.

2. Remove the belts from the fan sheave, clean the fan blades, and rotate the fan wheel by hand.

3. When the fan wheel slows to a stop, it should remain stationary. If it reverses direction and comes to rest in another position, the wheel is out of balance.

4. Other possible causes of a fan vibration are cracked or fraying belts, a bent shaft, worn bearings, or dirt on the rotor blade. Unless corrected quickly, one or more of the following problems may be encountered:

    - Noise
    - Worn or burned-out bearings
    - Weakening of fan supports
    - Loosening of the piping
    - Springing of the shaft or damage to the wheel
    - Damage to the belts

Rumbling

Rumbling sounds are generally due to faulty fan or motor bearings.

Troubleshooting

1. Stop the fan.

2. Remove the belts and rotate the fan by hand.

3. Each bearing should be observed in an effort to isolate the source of the noise. If the fan bearings appear to be satisfactory, observe the motor operation to see if it is the source of the noise.

4. Once the faulty bearing is located, it should be replaced as soon as possible.

Squealing

A squealing sound may be attributed to either loose or misaligned fan belts, or a dry bearing. Normally, the fan belts may squeal for a short time when the fan is started.

Troubleshooting

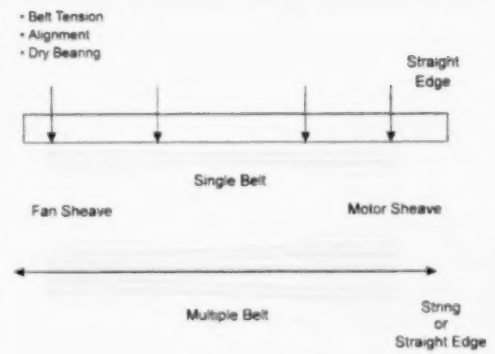
1. If a loud squealing sound continues after the fan reaches normal operating speed, check the belt tension and alignment.

    i) Tension: Check the tension of the belt using the methods outlined in section *8.7.2 Belts*.

    ii) Misalignment: To check sheave alignment, hold a straight edge or string tightly across the faces of the sheave (see ***Figure 8.9***). Alignment is correct when the straight edge touches the sheaves at the four points shown.

2. If excessive slack or misalignment has caused one or more of the belts to fray, the entire belt set should be replaced. It is not possible to properly tension a belt set when old and new belts are used together. The diameter of the old belt will normally be greater than that of the new one (see ***Figure 8.11***)

Figure 8.9 Belt Alignment



A squealing sound can be attributed to loose or misaligned fan belts or dry bearings.

Pulsation

Description: Excessive static pressure or resistance to airflow generates pulsation or flexing of the ductwork. Since abnormal static pressure results from air blockage, a loss of system airflow capacity generally precedes pulsation.

Troubleshooting

1. The most probable cause of air blockages is debris at diffusers and grilles or closed fire dampers. Remove debris for air intake and discharge locations, and check fire dampers to confirm that they are open, replacing fusible links as needed.

2. If this fails to correct the condition, extend the investigation to determine if outdoor, return or other dampers in the system are closed.

3. Ensure that filters in air handling units are clean as dirty filters can block airflow.

8.5.4 Filters

Description: There are three main types of filters: viscous impingement, dry (sieve or strainer) and electronic air cleaners. Each type has its own particular maintenance requirements. To maintain operating efficiency, air filters should be regularly inspected and cleaned or replaced. Exact requirements depend on filter type and outdoor environmental conditions. Monthly inspections for breakage and excessive buildup, and quarterly replacement or cleaning are appropriate. Filters will require more frequent servicing in downtown areas, near major highways, or near construction sites.

In apartment buildings, filters are typically found in corridor air systems, lobby ventilation systems, suite air handling units, parking garage ventilation systems, and sometimes on combustion air inlets to boiler rooms.

8.5.5 Laundry Room Exhaust

Description: The efficient operation of dryers requires exhaust systems. Dryers generate large quantities of lint. Dryer lint traps must be cleaned regularly as any other filters that may be in the dryer exhaust systems. The outside vent for dryers must be frequently checked as lint gathers on the protective bird-screens.

Collector ducts between dryers must be inspected and cleaned regularly. Dryers that take a long time to dry clothes generally have clogged filters or exhaust ducts. This not only affects the performance of the dryers, it is also an extreme fire hazard. Regular maintenance includes:

Action

1. Clean dryer lint screens daily.
2. If there is filtration or a lint screen on a common exhaust trunk, clean it daily also.
3. Every six months the following service should be completed:
   i) remove the backs of the dryers and vacuum.
   ii) change the belts and lubricate the motor.
4. Clean the exhaust outlet louver and bird screen. This louver should be hinged to allow easy access.
5. Annually, submit a ***Maintenance Request Form*** to the property manager for a chimney cleaning service company to completely clean the dryer exhaust system from the ducts to the outside louver.

8.6 Pumps and Valves

This section covers maintenance guidelines for pumps and valves.

8.6.1 Pumps

Description: Pumps circulate or move water or other fluids from one location to another, either in a closed system where the fluid is used over and over again (as in heating and cooling), or in an open system where fluid is consumed or replaced (as in a sump pump or domestic water pump). There are several types of pumps found in most buildings:

1. *In-line circulators,* which are mounted in the pipe line.
2. *Base-mounted pumps,* which have a pump and motor mounted on a common base and are connected through a coupling. These pumps may be vertical or horizontal split case, may be single or double suction and may have suction and discharge openings located in the end, side, or top.
3. *Close-coupled or built-together pumps,* which have the impeller located on the end of an extended motor shaft.

All equipment should be maintained in accordance with the instructions outlined in the manufacturer's manual. Regular ***"look/listen/touch"*** inspections will alert staff to most problems before they become serious. Common problems are listed below.

Vibration

Causes

1. Misalignment of motor and pump shaft
2. Loose pump and motor-base mountings
3. Pump base inadequately grouted
4. Pipe strain on either suction or discharge connections
5. Pump coupler:
   - broken or worn springs or arms on flexible coupler
   - worn discs in solid-type coupler
   - worn motor bearings
   - worn pump bearings
6. Worn impeller

Squealing

Squealing may be caused by a lack of lubrication on either the pump or the motor. It may also mean bearing or seal trouble.

Motor Failure

Action

1. If the motor will not start and the fuses are okay, fill out a ***Maintenance Request Form*** and forward it to the property manager.

Mechanical Failure

Causes

1. A frozen shaft on a pump may be caused by a lack of bearing lubrication, by a foreign object caught in the impeller, or by corrosion around the seal or impeller. Fill out a ***Maintenance Request Form*** and forward it to the property manager.

2. If flow problems are experienced (no heat or hot water for example), check that the valves are open and check the couplings. If a centrifugal base-mounted pump operates but does not circulate water, it may be air locked. A small petcock on the pump housing may be available to bleed out any air.

3. When seals or spring couplings are changed, it is wise to also change the motor resilient rubber ring mounts. This extends their life by properly lining up the motor with the pump.

4. Leaking mechanical seals and gaskets must be changed immediately. Fill out a ***Maintenance Request Form*** and forward it to the property manager.

Reasons for Mechanical Seal Failures

Description: The following describes potential reasons for mechanical seal failure:

1. Improper installation of the seal or the pump.
2. Operating while dry or partially dry.
3. Suspended solids in the circulating water.
4. Excessively high water temperature.

8.6.2 Valves

Description: Valves control the flow of liquids. They start, stop, direct, regulate, or throttle the volume and rate of flow of water, steam, or gases. There is no universal valve to accomplish all these purposes, but there are several basic designs generally found in buildings: gate, globe, butterfly, ball, disc, diaphragm, check and cock or plug valves. Each basic design has numerous modifications to meet special needs. It is essential to understand the mechanics of the particular valve under inspection or repair.

Valve Maintenance

With very little maintenance effort, thousands of dollars in valve replacement can be saved each year. Most manual valves need to operate only in emergencies. A little care will ensure proper operation when they are desperately needed. Valves that are usually left open should never be left completely open. The stem should be turned at least a half turn shut so that any corrosion will not seal it in the wide-open position.

Valve Leaks

Description: Leaking is the major problem with valves. A valve can leak internally by not shutting off completely. More obvious are external valve leaks at various connections,

such as where the pipe joins the valve or flange, around the packing, or where the body and bonnet connect.

Action

1. Frequent and regular inspections are the best practice for valve maintenance.

2. WHEN A LEAK IS FOUND, IT SHOULD BE CORRECTED, AS TIME WILL ONLY MAKE IT WORSE, NOT BETTER.

Use caution when opening a closed valve.

When opening or closing a valve, do so slowly. Surge pressure or a rapid temperature change can easily damage piping or equipment downstream of the valve. The condition created is sometimes called "water hammer." WHEN VALVES THAT ARE NORMALLY OPEN ARE CLOSED, THEY MUST BE TAGGED UNTIL THEY ARE OPENED AGAIN.

Blending Valves

Description: Use the following rules of thumb to help trouble shoot blending valves:

Troubleshooting

1. Check the power supply and fuses.

2. Check the position of the valve stem to make certain it moves when the motor operates.

3. Make sure the packing is not leaking. Excessive leaking will wear out the valve stem and make repack difficult.

4. With air-operated valves, air pressure closes the valve and spring pressure opens it. Check the air pressure.

5. If the problem is still unknown and cannot be easily corrected by maintenance staff, open the by-pass valve. Fill out a ***Maintenance Request Form*** and forward it to the property manager.

8.7 Electric Motors

This section covers maintenance guidelines for motors.

8.7.1 Motor Maintenance

Description: The following covers preventative and general maintenance issues for all motors.

Methods of Cleaning

It is important to remove dust in motors, as buildup can cause severe overheating leading to motor burnout.

Action

1. Clean motors on a regular basis and as soon as dust is noticed. All motors must be wiped clean at least once a year even in a clean environment. The dirtier the surroundings, the more frequently they need cleaning.

2. Oil filler caps must be kept closed at all times. Dust seals and gaskets must be inspected to ensure they are kept in good condition.

3. Replace worn or damaged seals. Their replacement is much less costly than a burned-out bearing.

4. Motors must be kept dry, as moisture significantly affects the insulation's ability to protect against short circuits and burnout. If moisture is present it should be dried before operation.

Vibration

Causes

1. Misalignment

2. Vibration in driven machinery:
   i) Rotors out of balance
   ii) Loose motor-mounting bolts
   iii) Worn bearings
   iv) Mismatched coupling.

Misalignment

Misalignment can result in:
- Sprung or broken shafts
- Failed bearings
- Motor overload.

Causes

1. Improper installation

2. Base-off level (settlement or bending)

3. Heavy loading

4. Excessive bearing wear

5. Loose mounting bolts

Some warning signs are:
- Excessive temperature caused by bearing overload
- Increased vibration
- Whirling or grinding sounds.

Correcting Misalignment (Belt Drive Only)

Action

1. Loosen mounting bolts, align couplings with a straight edge, retighten mounting bolts.

2. Place solid and secure shims under motor feet as required to align motor with the driven load.

8.7.2 Belts

Description: Belts are used to transfer power from motors to pumps and fans. Power transmission is effected by the action of friction between the belt's sides and the sheaves. The necessary contact pressure between the belt and the sheave is achieved by tightening the belt properly.

Problems Caused By Incorrect Belt Adjustment

1. Slack belts cause sheave and belt wear, and loss of speed due to running slippage.

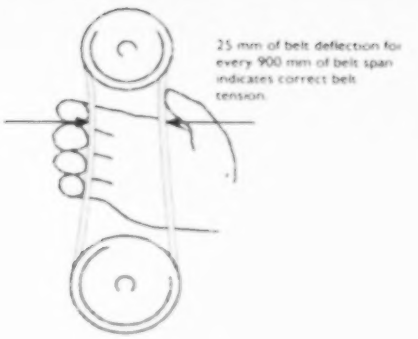
2. Belt slippage glazes the belt surfaces, and the heat from friction creates cracks in the belt.

3. Overly-tight belts wear out bearings by overloading.

4. Cracks in belts cause sheave wear and if not corrected, often break the sheave or other parts of the driven load.

5. Excessive noise.

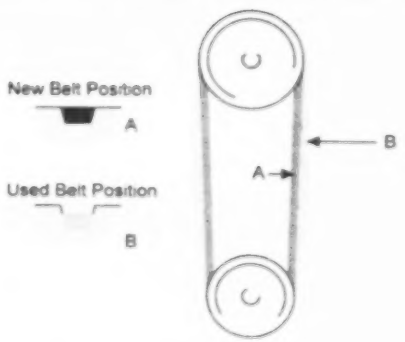
Figure 8.10



Incorrect drive belt tension and alignment is the major cause of bearing and belt failure. The illustration above shows an easy means of checking belt tension. Where the belt is grasped at the centre of the span as shown, approximately 25 mm for every 900 mm between shaft centers deflection should be obtained when "finger" pressure is applied.

Referring to Figure 8.10, excessive belt deflection is an indication of too little tension, leading to belt failure through wear and loss of wheel speed. Too little deflection indicates excessive tension, and will lead to noisy operation, premature bearing failure and decreased belt life.

Figure 8.11



Tips concerning fan belts: Matched belt sets must be ordered from the manufacturer as a matched set.

Bearings and shafting often fail because excessive belt tension destroys the oil film between the bearing and the shaft. Tension should be applied just until slippage ceases at normal load. When the drive is idle, the belts should appear snug. When in motion, a slight sag occurs in the direction away from the driving sheave.

Run-In Period

After the initial adjustments have been made, perform a run-in period of 48 hours. During this period two things should take place:

1. The initial stretch should be taken out of the belt.

2. The soft rubber surface of the outer envelope should be abraded and the belt should be seated at a slightly lower position in the sheave.

After this period, re-adjust the tension of the new belts. Unless new belts are re-tensioned, there is likely to be considerable slipping, burning or other damage to the belt.

Speed Control of Belt-Driven Blowers Action

1. With V-belt drive blowers, the blower speed (cfm) can be adjusted by changing the width of the sheave on the motor which effectively changes the sheave diameter and thus the speed of the blower.

2. An "A", "B", or "3L" sheave is always used with the corresponding "A", "B", or "3L" belt. **Do not try to adjust a sheave for a different section size of belt.**

8.7.3 Sheaves

Description: The following covers the adjustment of sheaves.

How to Adjust Sheave Speed

Action

1. Open and lock out the switch supplying power to the unit. Do not depend on fan switches or relays to keep power from the blower motor.

2. Adjust the variable pitch motor sheave for lower speeds by widening the space between the sheave halves, and for higher speeds by shortening the distance between the sheave halves.

3. Re-apply power to the unit and check for desired speed of operation. Check for vibration.

4. Do not exceed the maximum rated speed of the equipment.

Replacing the Sheaves

Description: The following covers the replacement of sheaves.

Action

1. The sheaves on the driven load are specially sized by the manufacturer and should not be replaced with different sizes unless there is a corresponding change to the motor sheave that will maintain driven-load speed within the rating of the equipment.

2. If changes are necessary it is preferable to make them to the motor sheave. A qualified mechanic should determine the ratio. They will understand fan operation characteristics, fan, pulley ratios and the use of the instruments that assure accurate adjustments.

8.7.4 Lubrication

Description: Friction is the force that resists the sliding motion between two surfaces in contact with each other. To overcome this resistance, a lubricant is used to separate the surfaces. The lubricant creates a thin film between the surfaces, reducing friction and preventing wear. Two types of lubricant commonly used are oil and grease. Oil is a liquid and grease is a semi-fluid product composed of oil and a thickening agent. The difference between oil and grease is in the consistency. Grease does not flow like oil and therefore tends to remain where it is put. A few caution points to follow are:

1. Never use oil in a grease fitting or vice versa.

2. Oil is harmful to taped and varnished insulation of motor windings (the copper wire assemblies within electric motors). Motor windings that have come in contact with oil must be properly cleaned by a motor service center.

3. Ensure that greases used to lubricate a motor are compatible. The easiest way to ensure this is to use the grease recommended by the manufacturer. In the absence of manufacturer's recommendations, contact a motor service center.

How To Grease A Motor

Description: The following covers step-by-step instruction on how to grease a motor.

Action

1. Remove the purge plug located opposite from the grease fitting

2. Clear out hardened grease from the purge opening.

3. Inject grease at the grease fitting until new grease is expelled from the purge plug opening.

4. After greasing, allow the motor to run for about an hour before replacing the purge plug.

5. After replacing the purge plug, wipe grease from exterior surfaces.

Motors lubrication should be scheduled according to manufacturers' recommended intervals. In the absence of such recommendations the following table is offered as a guide.

RPM	HP	Intermittent Operation	24 hr/day Operation
3,600	1 – 25	5 years*	2 years*
	30 – 40	6 months	2 months
	> 40	4 months	2 months
1,800	1 – 20	5 years*	2 years*
	25 – 50	4 years	1 1/2 years
	60 – 75	1 year	4 months
	> 75	9 months	3 months
1,200 and below	1 – 10	5 years*	2 years*
	15 – 30	4 years	1 1/2 years
	>40	1 year	4 months

* These motors often have sealed bearings that should be replaced at these intervals.

8.7.5 Bearings

Description: The bearings most commonly used are "anti-friction" ball or roller bearings, and sleeve bearings. Sleeve bearings are generally used only in small motors (under 1/2 hp) such as blower motors, and anti-friction bearings are used in larger or heavy-duty motors. The main desirable features of bearings are low friction, long service life, and low lubricant consumption. All pumps and fans have bearing assemblies.

Installation and Maintenance

Proper precautions during installation and maintenance can greatly prolong the life of bearings. This in turn prevents costly and disruptive, premature failures.

1. The most important factor for bearing maintenance is CLEANLINESS. Dust, dirt or any form of abrasive material is an anti-friction bearing's greatest enemy.

2. Dirty working conditions in the area where bearings are installed or maintained often lead to serious contamination and early failure. KEEP BEARINGS CLEAN—keep the area around bearings clean—DIRT MEANS DAMAGE!

Common Bearing Problems

The following is a brief list of common bearing problems. Refer to the *Table 1: Common Bearing Problems* for problems and possible causes:

1. Overheating

2. Vibration

3. Loose on shaft

4. Binding

5. Forcing bearings on to oversize or out of round shafting

6. Incorrect substitution.

Table 1 Common Bearing Problems	
Noise *(Call for service)*	**Probable Cause**
High pitch, steady tone	Excessive axial or radial load or misalignment
Low pitch, continuous or intermittent	Too much clearance, worn out
Intermittent squeal or high pitch noise	Ball skidding, or shaft slipping inside bearing race
Intermittent rumbles, rattles, clicks	Too much clearance in bearings; dirt in bearings; loose machine parts, bearing worn out
Excessive Vibration	**Probable Cause**
During acceleration or deceleration periods. *Call for Service if vibration is extreme or sustained for more than two or three seconds.*	Normal vibration at critical speeds of machine's components
During operation at fixed speeds. *Call for service*	Unbalanced rotating parts; shaft bent; cams, gears, or linkage; misalignment
Runout *(Call for service)*	**Probable Cause**
Shaft does not run true, or shaft binds when rotated by hand	Shaft bent; bearing misaligned; bearings rings out of square; dirt; machine deflection
Temperature	**Probable Cause**
High after first start	Grease distribution. Stop; allow to cool; restart
Continuously high	Too much/too little lubricant—check and correct
	Churning of lubricant. Confirm that lubricant is the correct type.
	Excessive axial load
	Excessive radial load
	Bearing misaligned
	Excessive seal drag

Bearing Replacement

Any of the following defects will cause unusual noise or vibration and should be serviced by a trained mechanic as soon as possible.

1. Broken or cracked rings.
2. Dented seals or shields.
3. Broken or cracked cages.
4. Broken or cracked balls or roller.
5. Bearings that have overheated. These bearings are generally darkened to brownish-blue or blue-black color.
6. Flaked areas on balls, rollers or raceways.
7. Bearings whose raceways are indented or "brinelled" by balls or rollers being impressed into the races.

When bearings are changed, ensure that the complete set of bearings is changed at both ends of the shaft.

8.8 Control Systems

This section is primarily for reference. The Building Superintendent should only address those areas clearly flagged as "Action" items. Design and setup should be left to specialists.

Control Strategy	Control Equipment			
	Timer	Thermostat or Aquastat	Stand-Alone Controller	Building Automation
Time of Day Schedule	Yes	Yes	Yes	Yes
Temperature Reset		Yes	Yes	Yes
Duty Cycle	Yes		Yes	Yes
Boiler Staging		Yes	Yes	Yes

A properly maintained control system minimizes building utility costs. The table above indicates which control equipment is best suited for a required control strategy.

For example, a Stand-alone controller can be used to reset the temperature (Temperature reset) of the heating distribution. A timer can not.

8.8.1 Control Strategies

The following control strategies are common in multi-residential buildings.

Time of Day Scheduling

Description: *Time of Day Scheduling* involves turning off certain equipment when it is not required, as per a predetermined schedule. Although all control equipment can perform this strategy, the more sophisticated equipment adjusts for weekends, daylight savings time, holidays, sunrise and sunset (for outdoor lighting), etc.

Typical devices that would use this control strategy are ventilation fans, exhaust fans, underground garage fans and lighting. Municipal building codes officials should be consulted before a time of day scheduling strategy is issued to shut down ventilation systems.

Temperature Reset

Description: *Temperature Reset* is the resetting of supply air or water based on the actual requirements of the building. Although the reset is usually based on outdoor air temperature and a reset curve, it is also possible to reset based on return water temperature, in-suite temperature sensors, demand limiting strategies (chiller), time of day schedules, etc.

Typical applications are heating distribution temperature, chilled water temperature, make-up air fan supply air temperature, etc.

Duty Cycling

Description: *Duty Cycling* is the control strategy used to cycle electrical and mechanical equipment to maintain a desirable space condition. For example, a supply fan can be cycled to just maintain a minimal temperature in a common area when the area is unoccupied. This strategy saves energy, as the equipment does not constantly operate.

Typical applications apply to ventilation fans, heating equipment, D/X systems, ramp heaters (cycled to maintain a slab temperature when moisture is present), etc.

Boiler Staging

Description: *Boiler Staging* control strategies are used to optimize the starting and stopping of multiple boilers. The control will turn the boilers on in a logical manner to reduce the cycling of the boilers while maintaining an adequate supply water temperature.

8.8.2 Time Controllers

Time Controllers (or timers) can be *electromechanical* or *electronic*. Both types operate by turning the equipment on and off by a schedule selected by the building operator. The controllers vary in the features, with the more advanced controllers allowing separate schedules for weekends, automatic time change for daylight savings and a battery backup for power outages.

BEWARE OF WHAT EQUIPMENT IS CONTROLLED BY TIMERS. INJURIES CAN OCCUR IF SERVICE IS PERFORMED ON SEEMINGLY DEACTIVATED EQUIPMENT THAT STARTS AUTOMATICALLY AND WITHOUT WARNING.

Electromechanical

Description: Electromechanical timers are very reliable, simple to operate and can function in harsh environments (-40°C to 60°C). They will, however, break down occasionally.

Action

1. Regularly check timer settings, and adjust time and day-of-week as necessary. The trip pins may need to be tightened, adjusted or replaced when they have fallen off.

2. If the timer is still not operating properly, forward a maintenance request to the property manager to have it replaced.

3. Electromechanical timers must be reset after a power failure.

Electronic

Description: Electronic timers offer increased accuracy and increased scheduling flexibility. They are microprocessor-based and may be able to automatically adjust for daylight savings or to operate equipment on a complex duty cycle.

Action

1. If the equipment is not following the proper schedule, check the timer settings and adjust if necessary. Check the original equipment manual to ensure that the controller is set properly.

2. If the timer is still not operating properly, forward a ***Maintenance Request Form*** to the property manager.

8.8.3 Thermostat/Aquastat

There are many types of thermostats and aquastats. The most common room thermostat maintains a set point temperature in the area.

Thermostats normally control heating and cooling valves, but may turn equipment on and off in response to temperature changes. The thermostat senses a temperature and adjusts the valve position or energizes equipment to achieve a desired temperature at the sensing element. Aquastats sense the temperature of water rather than air.

Wall Thermostat

Description: Wall thermostats can be used to control a fan coil unit, baseboard heater or fan incremental unit within the suite. They can also be used to control air handling units and unit ventilators in common areas.

There are three basic types of wall thermostats: line voltage (120V or 208V), low voltage (12V), and pneumatic. Care must be taken with line voltage thermostats because of the obvious electrical danger (see ***Section 5.0 Electrical, Lighting, Motors and Appliances*** of this manual for recommended safety measures).

Turning the thermostats as far up or down as they go and listening for the clicking sound of the internal contacts closing checks the operation of thermostats. The space conditioning system should be active as well. It is often less expensive to replace defective thermostats than to fix them.

If a programmable thermostat is not working properly:

1. Check the settings on it and make change as required.

2. If it is still not working properly, replace it. It will be less expensive to replace than to repair.

Integral (Built-In) Thermostats

Some heating and cooling equipment comes equipped with built-in thermostats. Because these thermostats attempt to sense space temperature from a point directly beside the source of heating or cooling, they do not control as well as wall-mounted thermostats. The adjustment dials are usually numbered, perhaps with settings one through five, rather than having control temperatures indicated. Typically they would require frequent adjustment by tenants.

Packaged terminal air conditioners (PTAC's) are commonly equipped with low-voltage thermostats, with a temperature setting dial on top. The dial may be located next to push buttons used to set fan speed.

Electric baseboard heaters often come equipped with built-in line voltage thermostats. The setting dial is on the face of the unit at one end.

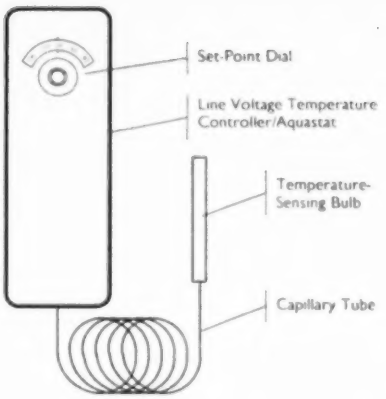
Some hot water baseboard heaters have built-in thermostats that require no electrical or pneumatic power. These thermostats work through the expansion and contraction of a volatile fluid under changes in temperature.

As with wall-mounted thermostats, it is easier and less expensive to replace failed built-in thermostats than to try to repair them.

Temperature Controllers/Aquastats

Description: Temperature controllers and aquastats typically operate at 120V. A temperature-sensing bulb is connected to the controller through a capillary tube. The bulb is placed in an airflow stream, or immersed in a temperature well in a pipe.

Figure 8.12 Temperature Controller/Aquastat



Action

1. If the equipment is delivering air or water at an inappropriate temperature, adjust the set point dial on the controller to the desired temperature.

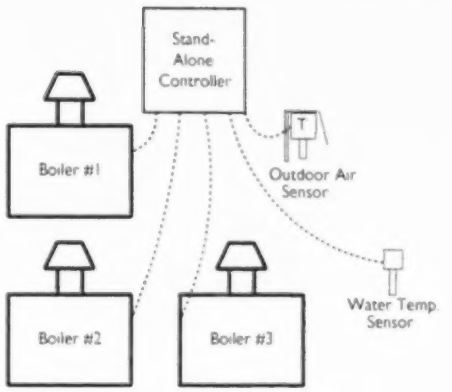
2. If the equipment is constantly running, or it is not running when it should be, check that the temperature-sensing bulb is entirely immersed in the air stream or the pipe well. Also check that the capillary tube is not crimped. If it is crimped, straighten the tube.

3. If the equipment is still not operating properly, fill out a ***Maintenance Request Form*** and forward it to the property manager.

8.8.4 Stand-Alone Controller

Description: Stand-alone controllers are generally used to control a group of related equipment. For example, a controller could be used to control a number of boilers based on a reset schedule with the outdoor air temperature.

Figure 8.13 Stand-alone Controller



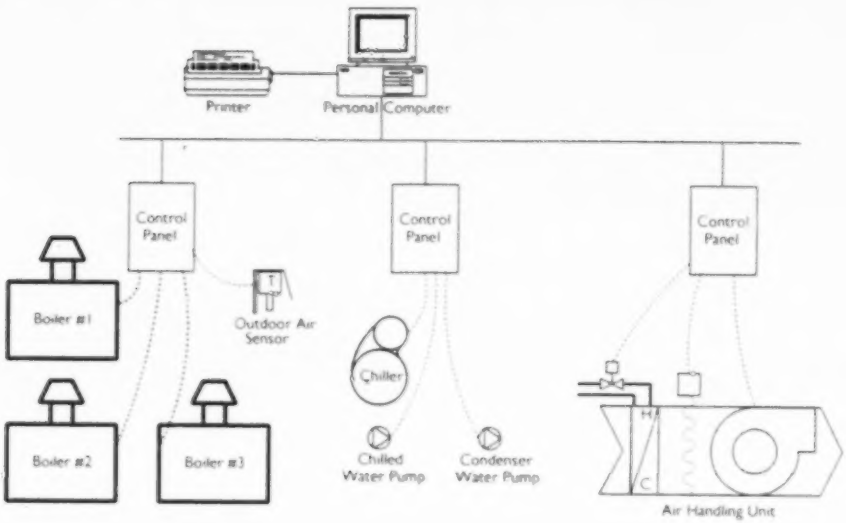
Action

1. If the equipment is not being properly controlled, fill out a ***Maintenance Request Form*** and forward it to the property manager. The Stand-alone controller must be serviced by a trained contractor.

8.8.5 Building Automation System

Description: A Building Automation System (BAS) is best described as a group of controllers interlinked through a network. A front-end personal computer can adjust set points in the system, monitor the system and aid in diagnosing problems. Off-site monitoring is also possible through a modem and a phone line.

Figure 8.14 Building Automation System



Action

1. If the BAS indicates an alarm on a piece of equipment, check the equipment for mechanical or electrical problems.

2. If the building loop water temperatures or the supply air temperatures are too high or too low, adjust the set point temperatures on the front-end computer. The ability to adjust these temperatures will vary from one BAS to another. Consult the original BAS operating manual. If the proper set point temperatures can still not be maintained, call for service.

3. If there is a problem with the network, a controller or a control device (valve, thermostat, contactor, etc.), call for service.

8.8.6 Air Compressor

Description: Most multi-residential buildings are fitted with electric control. Some buildings have pneumatic control, which are quickly identified by the presence of an air compressor. The air compressor supplies air to the pneumatic control components. The following routine maintenance should be performed on a monthly basis.

Action

1. Drain the compressor tank.

2. Lubricate the compressor motor.

3. Check the air filter for dirt by holding it up to a light. A filter that needs replacing will block out most (or all) of the light.

Replace the filter if required. **Do not clean air filters, unless they are specifically designed to be cleaned. The plastic and rubber seals on a filter tend to compress with age, allowing dirt to go past the seals into the compressor.**

4. Clean the compressor fins with a dry cloth or a vacuum cleaner.

5. Test the safety relief valve by pulling on the lever or ring. If it does not relieve air or does not return to fully closed position, call for service.

6. Check all the belts for wear. Replace them if necessary. **Replace all the belts on a compressor at the same time.**

7. Inspect the electrical connections, pressure gauges, airlines, etc. for abnormalities. Call for service if there is a problem.

8. Operate the unit for 10 minutes and observe unusual noises, air leaks or vibrations. Call for service if there is a problem.

9. Change the oil on the compressor at least once a year.

8.8.7 Central Hot Water Blending Valves

Description: Blending or mixing valves are used in some hydronic heating loops to control the supply water distribution temperature. These valves can be pneumatic or electric. The valves will typically be installed to fail open. On failure, the valve opens such that distribution temperature will be the same as boiler water temperature. If a valve fails the following should be checked:

Regular Inspection

Action

1. Make sure the packing is not leaking. Excessive leaking will wear out the valve stem and make repacking difficult. For a leaking valve, forward a ***Maintenance Request Form*** to the property manager.

2. With air-operated valves, air pressure closes the valve and spring pressure opens the valve. Use control to vary the air pressure and observe valve stem movement.

3. With electric valves, use control to vary the control signal and observe valve stem movement.

Valve Failure

Troubleshooting

1. If the valve is electric, check the power supply and fuses.

2. If the problem cannot be easily corrected, contact the property manager.

3. If the valve has failed to "no heat," open the manual bypass valve.

8.8.8 Maintenance of In-suite Motorized Valves

Description: Inspect the valve annually for smooth operation and packing leakage. Repack only if required. Clean the packing and re-lubricate it as necessary to retain free movement of the stem. Clean the top and insert the assembly and the exposed portion of the stem with a cleaner that is recommended

by the valve manufacturer. **Do not allow solvents to touch the diaphragm as it will cause deterioration**.

Action

1. Turn up the thermostat and wait a couple of minutes for the valve to open and the pipes to heat up.

2. If the valve is operating properly, the pipes to the radiator or coil should heat up. If the opposite end is cold, it means that the valve is not opening. Fill out a *Maintenance Request Form* and forward it to the property manager.

3. If the valve is stuck open, the apartment will overheat. Fill out a *Maintenance Request Form* and forward it to the property manager.

4. Faulty parts that are replaced should be returned to the Superintendent. The faulty parts should then be tagged with the suite number and given to the manager along with the completed *Heating Maintenance Report*.

8.9 Garbage Compactors

8.9.1 Operation

Description: Garbage compactors can be dangerous if not used properly. Untrained personnel should not be allowed to operate or repair the compactor. The equipment manufacturer's instructions must be followed at all times. Information on the operation, repair and safe use of garbage compactors can be obtained from the Industrial Accident Prevention Association.

General guidelines for garbage compactor operation are as follows:

Before Operation

Action

1. Ensure the compactor is turned off at the power source (Motor Control Center) and at the control panel.

2. Ensure the area around the compactor is clean and not slippery.

3. Ensure all safety devices are intact on the machine. (access doors, guards, interlocks, etc.)

During Operation

Action

1. Open the cover to the compactor and load to the specified level.

2. Close the access door and activate the main power.

3. Unlock the control panel.

4. Start the compactor operating cycle.

5. After the compactor has gone through its cycle, and the ram has returned to its starting position, stop the machine.

6. Lock the control panel. Return to step 1 if more garbage is to be compacted.

After Operation

Action

1. Stop the machine with the stop button on the control panel.

2. Turn off the panel and remove the key.
3. Check the ram to ensure it has returned to its starting position.
4. Check to ensure that the loading chamber is empty.
5. Turn the main power off.
6. Return the control panel key to its designated location.

8.9.2 Maintenance and Servicing

Description: The following is a list of garbage compactor problems and the probable causes. The items marked with an asterisk* may be corrected by the building operator only after the power to the unit has been shut off. For other repairs, turn off the power to the unit and then fill out a *Maintenance Request Form* and forward it to the property manager. Hardhat, safety glasses and safety shoes must be worn when servicing the compactor. Normally, compaction will start automatically when garbage in the hopper reaches a designed weight.

Unit Keeps Running

Causes

1.* Dirty glass on the electric eye
2. Electric eye out of alignment
3.* Defective or weak bulb
4. Open circuit in photocell wiring
5. Relay stuck
6. Dirt in relay
7. Micro switch out of adjustment or alignment

Motor Keeps Running—Ram Does Not Move

Causes

1. Low oil
2. Defective relay
3. Broken valve assembly
4. Broken hydraulic hose

Unit Stops Running

Causes

1.* Faulty fuse
2. Faulty on/off switch
3. Dirty and/or faulty mechanical latch

No Automatic Operation (Manual Only)

Cause

1. Faulty micro switch

Unit Jammed In Full Forward Position

Causes

1. Shorted micro switch
2.* Foreign matter under ram
3. Faulty power unit
4. Stuck relay
5. Pressure switch defective or out of adjustment

Unit Jammed In Rear Position

Causes

1. Micro switch out of adjustment or alignment
2. Sides and bottom of ram need lubrication

Fuses Keep Blowing

Causes

1.* Check circuit breaker-reset button

2.* Improper size fuse in unit

3.* Improper size fuse in main unit

4. Faulty power unit

8.9.3 Safety

Description: The following rules should be followed when using a garbage compactor.

Action

1. Keep access door closed when the compactor is in operation and locked when it is not in use.

2. Report any hazard or malfunction of the compactor as soon as it is noted. Fill out a ***Maintenance Request Form*** and forward it to the property manager.

3. Do not bypass electrical switches or safety limit switches.

4. Lock all compactor equipment panels and operating control when not in use.

5. Keep arms and body clear of all moving parts.

6. At the first sign of smoke or fire, shut down the equipment and attempt to extinguish with a fire extinguisher. If the fire is not under control within one minute, call the fire department.

8.10 Elevators

There are two basic types of elevators:

1. **Hydraulic Elevators** typically supply two or three floors and have their elevator machine room located on the ground or basement floor.

2. **Gearless Traction Elevators** supply four or more floors and have their elevator machine room directly above the elevator shaft.

8.10.1 Maintenance

Elevator maintenance is the joint responsibility of the maintenance staff and the elevator service contractor. Because the elevators are the most visual of all the building systems, faulty elevator operation can have a major impact on how the tenants perceive the overall maintenance level in the building.

Housekeeping

Description: Maintenance of the elevator lobbies, elevator cabs and elevator machine rooms are usually the responsibility of the maintenance and custodial staff. For directions on cleaning instructions, graffiti removal, etc., see ***2.0 Housekeeping***.

Operation

Description: Perform the following observations and tests. The elevator service contractor is responsible for repairing problems with the elevator operation. If there are any problems, fill out a ***Maintenance Request Form*** and forward it to the property manager.

Monthly Checks

Action

1. Ride each elevator, and check for abrupt stops and starts, and unusual vibrations. Listen for squeaks and scrapes. (Closing the eyes will help to tune the senses).

2. Check the door reversal of each elevator. If the door has a rubber safety shoe, the door should reverse direction as soon as the safety shoe is touched. If the door has an electronic detector or light-ray mechanism, the door should open as soon as something is placed in the doorway.

3. Check the opening and closing times of the doors. Typical limits for elevator doors are:

Width and Type of Doors	Opening Time	Closing Time
1,050 mm Center Opening	1.1 to 1.5 seconds	2.3 to 2.5 seconds
900 mm Single Slide	1.7 to 2.3 seconds	3.3 to 3.5 seconds
1,200 mm Two Speed	2.1 to 2.7 seconds	4.0 to 4.2 seconds

The doors should be adjusted to stay open long enough for people to enter and leave without wasting time. This will vary with each building.

4. Check the time it takes for the elevator to start after the door has closed. Ideally, the time should be less than one second.

5. Check that the elevator stops level with each floor.

6. Check that all floor indicators and overhead lights are operating.

Annual Check

Action

1. With the elevator in service, time how long it takes to go from the ground floor to the top floor. Time how long it takes to go from the top floor to the ground floor. Calculate the speed of the elevator in both directions, and compare it to the rated speed. There is an operation problem if the speeds are much less (or much more) than the rated speed.

Building maintenance and custodial staff must be prepared to handle elevator emergencies. When confronted with fire, power blackouts or passengers trapped in stalled elevators, the on-site staff must know how to handle the situation and who to call for assistance.

Elevator Emergencies

Description: Elevators are usually equipped for "Firefighter Service" or "Emergency Service," which entails special control, and in some cases, an automatic return to street level.

Action

1. Know the control features of the elevators, and make sure that they are properly labeled.

2. Know how the special control features operate and how they are initiated and tested.

3. Know where the control keys are located.

4. Know how the control react if there is a loss of power.

5. Ensure that signs are in place to restrict elevator use during a fire.

Loss of Power

Description: Many buildings are equipped with emergency power supplies. These include provisions to operate elevators in different ways.

Action

1. Know which elevators, if any, will operate during a power failure.

2. Know whether the elevators switch to emergency power automatically or manually.

3. Know whether the elevators automatically return to the main floor and who is responsible for initiating the manual switch or re-call.

4. Know where the emergency power switches are located and make sure that they are properly labeled.

5. Know whether the elevators have battery operated emergency lighting units and a battery-operated "Emergency Call" button.

Not all elevators are connected to the emergency power generation equipment. Should a power failure occur, people could be temporarily trapped in the elevator. In that case, follow the instructions in the section *Trapped Passengers*.

Emergency Recall

Description: The emergency recall control will return the elevator instantly to street level. This action can also be initiated manually with a key switch located at the street level, or automatically through the fire alarm system. The key should be located where the building staff or the fire department can easily find it. It should be covered and marked "Emergency Recall." When the emergency-recall device is activated, the following occurs:

1. All calls are canceled instantly.

2. All door re-opening devices are rendered inoperative (safety shoe, light ray, electronic detectors).

3. Elevators parked at floors other than the street floor will return non-stop to the street level.

4. Elevators traveling away from the street level will reverse and return to the street level, non-stop.

5. Elevators on independent service will be given an audible signal to close the doors and will return to the street level, non-stop.

6. The emergency stop switch will be rendered inoperative.

Turning the "emergency recall" key switch to the "OFF" position restores normal operation.

In-Car Emergency Service

Description: The in-car emergency service allows the firefighters to use the elevators for firefighting or rescue operations. This service

can be initiated by using a key switch, which is located in or adjacent to the car-operating panel, and is marked "Emergency ON-OFF." When the key is activated, the following occurs:

1. The elevator can only be operated by the person in the car and will not answer any calls.

2. The elevator will operate when one or more calls are registered. Constant pressure on the "Door Close" or any car call button will close the doors. Pressure release on the button before the door closes will allow the doors to immediately open.

3. Any error in car call can be canceled by momentary operation of the emergency key switch to the "OFF" position.

4. After the door closes, the car will run to the car call floor and stop with the doors closed. Putting constant pressure on the "door open" button can open doors. If pressure is released, the doors will re-close immediately.

5. Once fully opened, the doors will remain open until closing is initiated manually.

Turning the "emergency" key switch to the "OFF" position restores normal operation.

Trapped Passengers

Description: Passengers trapped in an elevator may be distressed. It is very important to assure them that they are safe inside the elevator, that there is sufficient natural ventilation, and that help is on the way. The following procedure should be followed if people become trapped in an elevator:

1. Under no circumstances attempt to remove passengers through the entrance doors if the elevator is not at floor level.

2. Do not allow anyone other than rescue personnel to attempt rescue operations.

3. Ask the passengers questions such as "Can you push the 'Door open' button?" or "Can you pull out the 'Emergency Stop' button?"

4 Phone the elevator service company, and provide them with all the details: Name, phone number, building name and address, and the elevator type involved. Note the time that the phone call was made.

5. Maintain constant communication with the passengers and reassure them that help is on the way and that they are safe.

6 Try to identify the elevator's position to the nearest floor.

7. Instruct the passengers to stay put unless they can walk out normally.

8. When the elevator service company arrives, note the arrival time and the name of the mechanic.

9. Fill out the ***Elevator Log*** form, detailing the problem and the action taken. A blank copy of this form is located at the end of this chapter.

8.11 Overhead Garage Doors

Mechanically operated overhead doors serve two purposes. They maintain a degree of security and keep exterior elements out of the garage area.

8.11.1 Preventive Maintenance

Description: Preventative maintenance will reduce the number of problems with the overhead doors.

Troubleshooting

1. Check that the door is square when closed and that it remains square throughout its operation.

2. If the door does not roll freely, check the track spacing. A properly fitted door should have about 60 mm side-play.

3. Once the lift cables begin to fray, both cables should be changed as soon as possible. If one of the cables break, the door will twist and likely result in damage.

4. If one of the cables is slack when the door is in the open position, check to see that the door is level when it is closed. Ensure the tops of the vertical tracks are an equal distance from the top of the door, and that the horizontal tracks are parallel and square with the door.

5. Use a multi-purpose grease when lubricating the working parts of the door. Check for a wax type spray for the torsion springs and the horizontal tracks at the curve. As the track rollers move in the tracks, they will become lubricated and allow the door to run more smoothly. Before applying the film of wax, be sure that the tracks are clean. Ask the manufacturer for specific instructions for lubricating their product.

6. The V-belt should be checked regularly and replaced if cracks are noticed.

7. If problems occur, determine if they are electrical or mechanical. When reporting, describe what actually happened such as "door would not open," or "door is stuck half-way." It may be necessary to open the door manually and leave it that way until the problem is corrected.

8.12 Garage Ramp Heaters

Garage ramp heaters are used to prevent parking garage ramps from becoming slippery during icy weather conditions. They are intended to melt ice, not to keep the ramp surface warm or to evaporate water when it rains. Ramp heaters are a convenient alternative to the application of sand or salt. They should operate only when needed.

The three types of ramp heaters are:

1. *Electric cables.* Electric snow melting cables are embedded in a back-and-forth coil pattern in the concrete or asphalt. They heat up when an electric current passes through them. This is the most common type of ramp heating system.

2. *Glycol pipes.* A heated fluid, usually glycol, circulates through pipes embedded in the ramp. This system is a bit more complex because it incorporates a pump. The glycol is normally heated from the main heating plant through a heat exchanger.

3. *Infrared heaters.* Overhead heaters, similar to those used in hockey arena stands, project heat down onto the ramp surface. This system is rarely used.

Types of Ramp Heaters

There are a variety of ramp heater control systems on the market, which should operate to bring on the heating only when needed.

The most common systems are:

1. *Hand switch.* The Superintendent or someone else turns on the heat as needed, and turns it off when not required. This is the simplest system, but also the least convenient and can be quite wasteful since the heat will inevitably be left on for periods when it is not required.

2. *Temperature sensing.* An outside air thermostat turns on the heat when outside temperature drops below a set temperature (about 2°C). The heat will always be on when ice could form on the ramp, but will remain on essentially all winter, even on clear days when ramp heat is not necessary.

3. *Precipitation sensing.* This sensor, which detects rain and snow, is located near the ramp. It activates the ramp heat whenever outside air is below a particular temperature and precipitation is detected at the same time.

4. *Slab moisture sensing.* This is the preferred control system, involving a special sensor embedded in the ramp surface. The sensor enables the ramp heat only when the slab temperature is below freezing and moisture is detected.

8.12.1 Preventive Maintenance

Description: These are specialty systems, therefore most preventive maintenance should be undertaken by a knowledgeable contractor.

A Superintendent should take the time to become familiar with the system and how it is intended to operate, so problems can be diagnosed to some extent before the contractor is called. Discuss the system with the building manager or contractor.

Troubleshooting

1. The automatic controls often fail, causing very costly energy waste. For this reason, their operation should be tested at least at the start of each heating season and in the middle of the season. Specific testing procedures will depend upon the control system in place.

2. For a glycol system, check that the pump is working at the start of each heating season.

3. For a glycol system, use a hygrometer to test the specific gravity of the glycol. If necessary, partially drain the system and add propylene glycol to create a solution that will not freeze under mid-winter conditions (mix to -30°C rating in most parts of the country). If there is an older system charged with ethylene glycol (which is toxic), talk to the property manager about proper disposal. **Never pour ethylene glycol down a sewer drain.** Mixing down to the point of the most severe winter temperature is not necessary, since a glycol mix will turn to a slurry long before it freezes solid. Equipment damage will only occur when the mixture freezes solid. For example, if the coldest night of the winter is -40°C, a glycol mix rated at -30°C will freeze to a slurry but will not damage equipment.

Further Reading

Colen, Harold R., PE, HVAC Systems Evaluation, *R.S.Means Company Inc.*

The Institute of Real Estate Management, The Resident Manager: On-Site Management Handbook for Apartments and Condominiums, *The Institute of Real Estate Management*

Liska, Roger W., PE, Means Facilities Maintenance Standards, *R.S.Means Company Inc.*

National Standards of Canada, Boiler, Pressure Vessel, and Pressure Piping Code, *Canadian Standards Association*

National Standards of Canada, Mechanical Refrigeration Code, *Canadian Standards Association*

Ontario Government - Ministry of Housing, Energy Management Operations High-Rise Apartment Buildings Manual, *Queen's Printer for Ontario*

Ontario Government - Ministry of Housing, Planned Maintenance Manual, *Queen's Printer for Ontario*

Ontario Government, A Guide to the Occupational Health and Safety Act, *Queen's Printer for Ontario*

Ontario Government, Operating Engineers Act, *Queen's Printer for Ontario*

Ontario Hydro, Energy Management Control Systems: Reference Guide, *Ontario Hydro*

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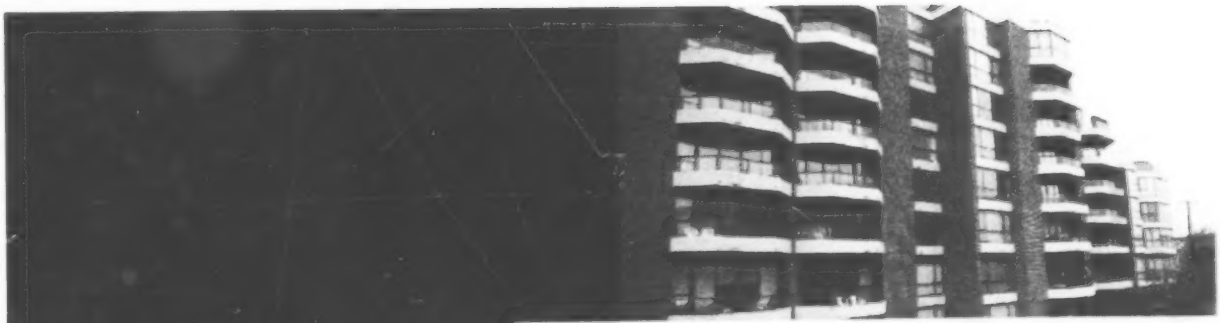
Resident Managers' Training Institute, Apartment & Condominium Operators' Manual, *Resident Managers' Training Institute*

Rowe, William H., PE, HVAC Design Criteria, Options, Selection, *R.S.Means Company Inc.*

Shear, Mel A., Handbook of Building Maintenance Management, *Prentice-Hall Inc.*

Shear, Mel A., Property Management Reinvented; How to Convert Maintenance and Energy Expenses to Profits, *Prentice-Hall Inc.*



BLANK FORMS

Tenant Request and Permission to Enter For In-Suite Maintenance

I, the undersigned, hereby acknowledge that I requested the maintenance described below to be done in my apartment.

I expect that this work will be completed as soon as possible. I authorized the management staff, or if necessary, a contractor to enter my apartment during reasonable hours in order to complete the work.

Notwithstanding my absence from the apartment at the time of entry, my signature on this request form shall be my consent to enter my apartment to do the work described below. Should more than one visit be necessary to correct the problem I also give my consent.

Tenant's Name: _____ Suite No. _____

Building Name & Address: _____

Date: _____ Tenant's Signature: _____

Resident: Please fill out the above information and submit to the Superintendent. Do not fill out beyond this point.

Description of Problem & What Was Done to Correct it: _____

Date Completed: _____ By Whom: _____

Maintenance Request Form
-- General --

Building Address:	Floor:	Home Phone:
Resident's Name:	Suite:	Work Phone:
Request:		
Request Received By:		Date:

I, the undersigned, hereby acknowledge that I requested the maintenance described below to be done in my apartment. I expect that this work will be completed as soon as possible. I authorized the management staff, or if necessary, a contractor to enter my apartment during reasonable hours in order to complete the work. Notwithstanding my absence from the apartment at the time of entry, my signature on this request form shall be my consent to enter my apartment to do the work described below. Should more than one visit be necessary to correct the problem I also give my consent.

Resident's Signature:	Date:

Resident: Please fill out the above information and submit to the Superintendent. Do not fill out beyond this point.

A. Conditions in the Suite

Inspected By:	Date:

B. Action Taken to Fix Problem

Problem Corrected By:	Date:

C. Recommended Action Required

Recommended By:	Date:

D. Property Manager

Action Taken	Number	Who to Correct	Date Issued
☐ Work Order			
☐ Purchase Order			
☐ Resident to be Invoiced ?	☐ Insurance Claim #		

Work Authorized By:

Date:

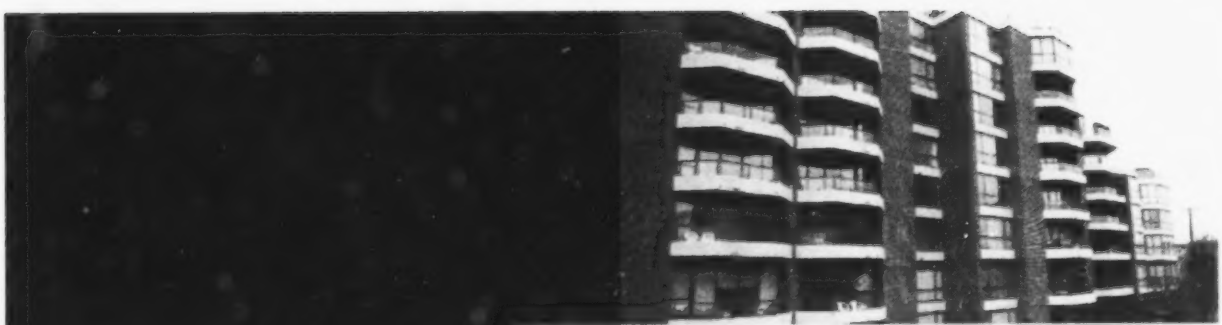
Work to be Done:

Elevator Log

Building: _____
Building Operator: _____
Property Manager: _____

Month: _____

Date	Elevator Number	Problem	Time Elev. Company Called	Response Time	Mechanic	Action Taken	Reported By



SECTION 9.0

security and communication

Section 9.0 Security and Communication

9.1 Introduction

This section covers several building security and communications issues. Building security is becoming more of an issue as the Canadian population ages and crime awareness increases. The level of security varies between different types and different locations of buildings. There are, however, common strategies or guidelines that should be practiced in all buildings.

9.2 Security Guidelines

The following security guidelines are not applicable to all buildings. Discretions and direction from the property manager should be adhered to.

9.2.1 Site Entrance

Description: Where tenant expectations warrant, people should be closely monitored on building property. The following guidelines should be practiced with respect to allowing entry to non-occupants:

Action

1. A Sheriff or Bailiff required to serve a Summons or Court Document should be allowed to enter after showing a badge to prove their identity.

2. A Bailiff with a Repossession Order giving them authority to impound furniture, cars, etc., should be allowed entry to the location, but should be offered no further assistance.

3. When the ambulance arrives, assist ambulance attendants/paramedics if possible. They may require an elevator to be put "on service." Find out the name, apartment number and reason for their visit.

4. Tradesmen or contractors should show a copy of the Purchase Order and proper identification. They should be directed to use the service entrance when applicable.

5. If the building has a gatehouse, guards should obtain all visitors' names and license plate numbers. The resident being visited should be contacted (if time permits) before visitors are allowed entry.

6. Solicitors should not be allowed access to the building. Instruct them to distribute their pamphlets through the post office.

7. By law, political canvassers must be given access to the building during election times.

8. Cooperate with the police officers during their visit. The name of the officer, badge number and division number should be recorded.

Occupants should be informed that they are to politely challenge strangers who are in the building or are trying to gain access. Instruct occupants to not let strangers pass through the doors of the building as they enter or as they allow guests in via a remote entry access system.

Ensure that stairwell door, maintenance room doors and other access doors are not propped open.

9.2.2 Assault

Description: An assault can happen any time even after all reasonable preventions have been taken. Every situation is different, and common sense must be used at all times. Some guidelines that may be used when an assault occurs in the building are as follows:

Action

1. Call the police, and direct them to the scene of the assault.

2. All the while exercising personal safety, inform the assailant(s) that the police are coming.

3. Give the assailants reason to believe that there are more people on the way. This can be done by talking to an imaginary person, or by talking on a two-way radio, giving the location of the assault. Hopefully at this point, the assailant will take flight.

4. If outnumbered, or if it is thought that there are weapons involved, wait for the police.

9.2.3 Parking

Description: The following limitations should be placed on parking:

Action

1. All posted fire routes should be kept clear at all times. Call the municipality parking control authorities when there is a car in the fire route.

2. Enforce rules such that parking for handicapped persons and visitors parking are used properly. Where allowed by law, issue municipal parking tickets to offenders.

3. Indoor parking lots should not be used as car repair areas.

4. Ensure that parking garage lighting is sufficient for security. Replace burnt bulbs immediately.

9.2.4 Theft

Description: Unfortunately, property theft is a reality of life. The Property Manager is responsible to use reasonable steps to minimize the risk of theft. That includes notifying tenants of security issues (through the ***Tenant Information Package***), and remaining aware of risk areas. However, when theft does occur, it is up to the tenant to notify police and deal with the insurance company. Some guidelines for theft prevention are as follows:

Action

1. Where there is a persistent risk (for example tenants are regularly admitting strangers to the building, or a particular side door is often left open), post notices in the lobby and elevators to remind tenants of the risk and their responsibilities.

2. Repairs dealing with building access and security are treated in the same way as other repairs. The urgency of a particular repair is a matter of personal judgment, but overall security items should be given high priority.

3. If there is a pattern of incidents (for example cars parked in one part of the garage are repeatedly broken into),

suggest reasonable steps to the property manager. This may include adding lighting to the area, installing a hidden camera, or providing the police with details and cooperating in their investigation.

4. If a theft in progress is encountered, give the thieves reason to believe that there are more people on the way. This can be done by talking to an imaginary person, or by talking on a two-way radio, giving the location of the theft. Hopefully at this point, the thieves will take flight. If outnumbered, or if there is any concern for personal safety, call the police and wait for them to arrive.

9.3 Closed Circuit Monitors

Description: Many large building complexes have cameras and closed circuit monitoring systems. It is important that:

Action

1. The camera and recording devices are operating properly and kept on.

2. Non-threatening irregularities that are detected by the cameras be investigated. (for example, entrance door propped open.)

3. The proper authorities are called immediately if an irregularity could result in injury. (for example, fire, assault)

4. Record system malfunctions. Adjust the controls to try to fix the problem.

5. If the problem cannot be fixed, return the controls to their original settings, and call security company for service.

9.4 Communication Devices

Description: Hand-held two way radios, beepers and intercoms are used to allow the site staff to travel within the building and the grounds while keeping in contact with one another. These devices should only be used for relaying important messages, for contacting one another and for emergencies. General rules for radio use are:

Two Way Radios

Action

1. Initial contact should be "*Person 1* to *Person 2*, Over."

2. The reply should be made as "*Person 2* to *Person 1*, Over."

3. The two people are then to talk until the message or instructions are over. The last word spoken should be "Out."

4. Radio silence is important to ensure emergency messages are passed quickly. Unimportant talk or chatting should not take place.

9.5 Locks

The maintenance and custodial staff should be aware of any lock problems, regularly test common area locks, and know how to replace suite entrance cylinders. For this purpose, an appropriate supply of cylinders and keys should always be on hand. Suite entrance cylinders should be replaced for the following reasons:

1. They become defective—call for service when half of the spare cylinders are defective.

2. When a tenant moves out—switch cylinders and check to ensure that a master key will work on the new cylinder.

3. If tenants lose their keys—switch cylinders and ensure that a master key will work on the new cylinder.

Deadbolt locks should have a 2.5cm (1") throw.

Replacement Cylinders

An on-site inventory of replacement cylinders should be double the expected amount of monthly suite turnover. Stay ahead of monthly requirements and order replacement stock immediately.

9.5.1 Lubricating Locks

Preventive Maintenance

Description: Standard locks are made of brass and should not be lubricated with oil. The oil becomes sticky and keeps the tumblers from working properly. If oiled, it will be necessary to remove all parts and clean thoroughly.

Action

1. Lubricate brass locks with graphite only. Graphite is available in handy tubes or in liquid form. (such as WD 40.)

9.5.2 Checking Locks

Description: If a key does not turn the lock freely and easily, the problem must be remedied, or the key will eventually break off in the lock.

Troubleshooting

1. Lubricate the lock as per 9.5.1 and see that the key is pushed completely into the lock.

2. Try turning with thumb and forefinger. **Never use pliers!**

3. While turning with the right-hand, lift up on the doorknob with the left hand. If this releases the pressure on the key, the metal plate on the doorjamb is too high and should be lowered, or the door hinges are loose or worn. If lifting increases the pressure on the key, and pushing down on the doorknob releases the pressure, it is evident that the plate is too low and must be raised.

4. Push in on the doorknob. If this releases the key so that the bolt will turn freely, the plate is too close to the doorstop, which is the narrow strip of wood that the door contacts. This may be remedied either by moving the plate outward or moving the doorstop inward.

5. Deadbolt locks should have a 2.5 cm (1") throw.

Further Reading

Liska, Roger W., PE, Means Facilities Maintenance Standards, *R.S.Means Company Inc.*

Ontario Government - Ministry of Housing, Planned Maintenance Manual, *Queen's Printer for Ontario*

Ontario Government, A Guide to the Occupational Health and Safety Act, *Queen's Printer for Ontario*

Resident Managers' Training Institute, Apartment & Condominium Operators' Manual, *Resident Managers' Training Institute*

Shear, Mel A., Handbook of Building Maintenance Management, *Prentice-Hall Inc.*

Shear, Mel A., Property Management Reinvented; How to Convert Maintenance and Energy Expenses to Profits, *Prentice-Hall Inc.*

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